

Computing today

NOVEMBER 1984

90p

BUSINESS MATTERS

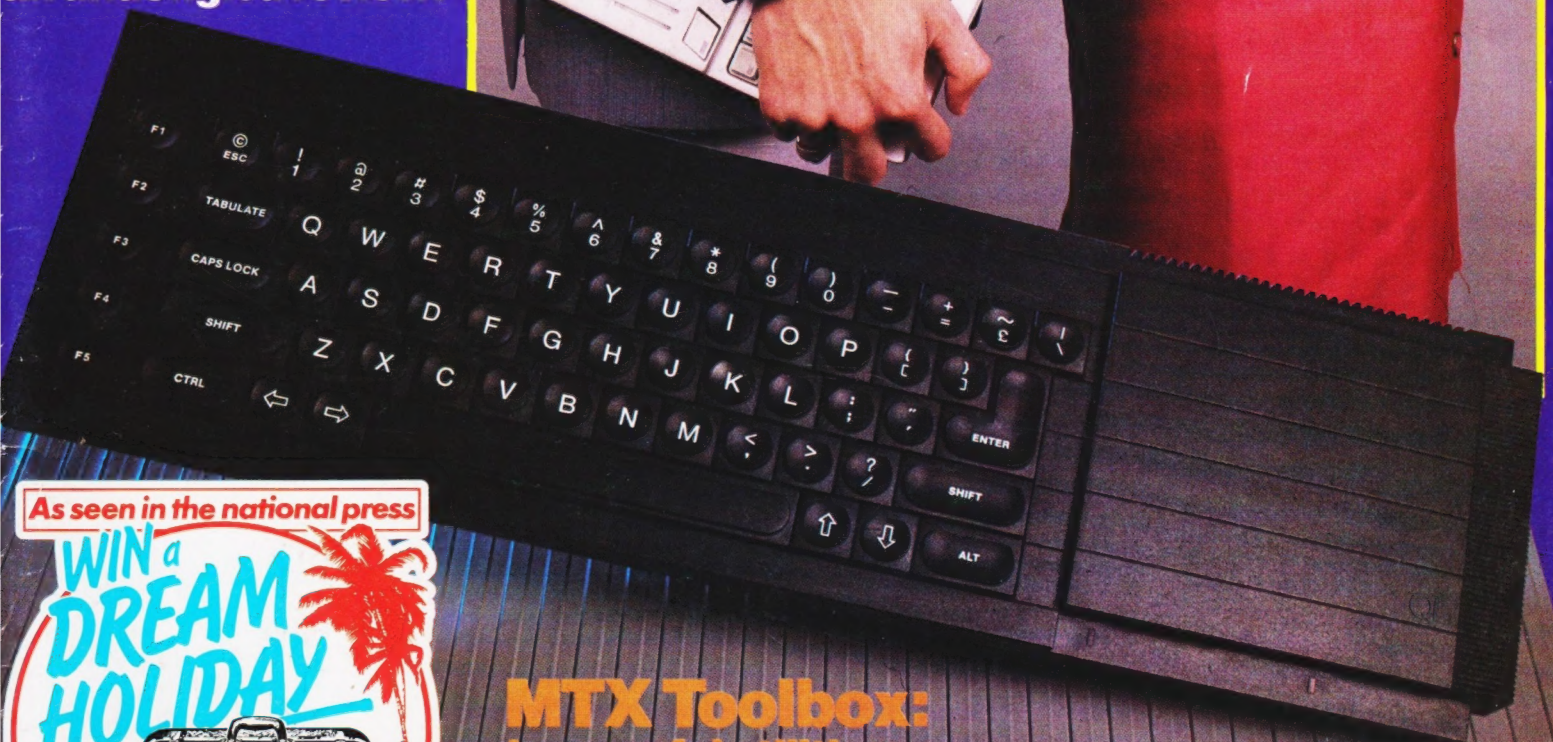
A guide to some of the affordable machines for business use

PORTABLE POWER

the Epson PX-8 and Apple IIc on test

AT LAST THE QL

an undongled review!



As seen in the national press



MTX Toolbox:
two useful utilities
to type in

A Macreview
of the amazing Macintosh

ANIROG

ZAGA

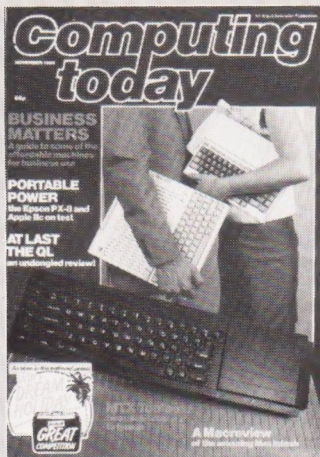
MISSION

This diagonally scrolling maze game features superb 3D graphics brilliant sound effects and requires 100% concentration to successfully manoeuvre your helicopter through unknown hazards in order to complete Zaga Mission and live to play another day — Commodore 64 — £7.95



Also available on Disk at £9.95

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Computing Today is constantly on the look-out for well written articles and programs. If you think that your efforts meet our standards, please feel free to submit your work to us for consideration.

Potential contributors are asked to take note of the points raised in our Program Submissions page, which can be found on page 14 of this issue.

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EDITORIAL & ADVERTISEMENT OFFICE

No. 1, Golden Square, London W1R 3AB.

Telephone 01-437 0626. Telex 8811896.

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After stunning everyone with the Lisa and Macintosh, which took computing in a totally new direction, Apple have done another about-face and brought out the IIC, a portable computer in the traditional Apple mould. Here's our review.

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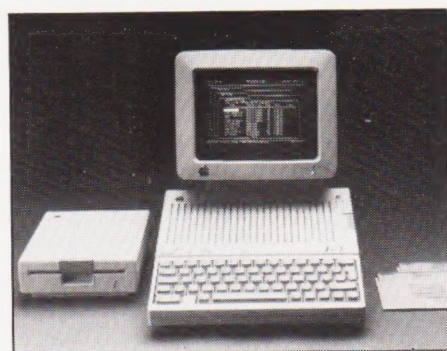
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A 16-page guide to buying a business computer.

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An unkludged one, that is. We finally got our hands on a QL that had all its electronics inside the case, and quickly passed it on to a reviewer (Sinclair only let us keep it a week!). Here's what he has to say.



OF MICE AND MACS60

Almost as hard to obtain as a QL, our Macintosh was finally borrowed from an obliging shop rather than Apple. It made quite an impression in the office, but what did our more hard-headed reviewer think?

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Our concluding article looks at various animation techniques available on the Atari, from display list manipulation to colour rotation and player-missile graphics.

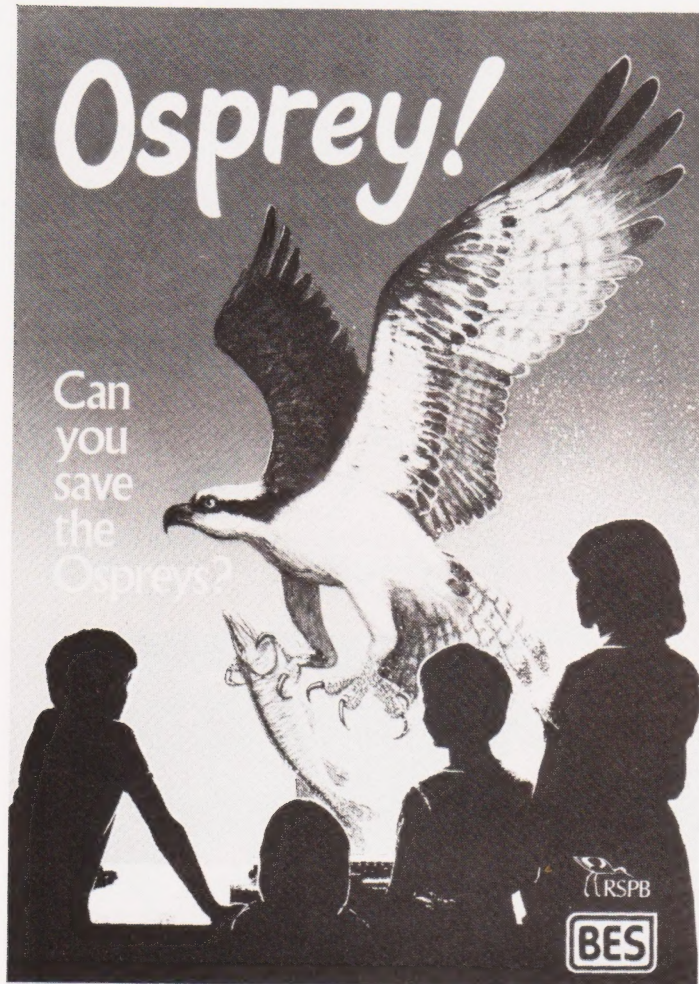
MTX TOOLBOX73

A couple of useful utilities that will help MTX owners get more out of their machine (even when Newword crashes).

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Osprey!

Can you save the Ospreys?



NOT GETTING THE BIRD?

Osprey! is the first release of a new series of 'Discovery' programs from Bourne Educational Software. While still being an us-against-them-type game, Osprey! has been developed in conjunction with the RSPB and

it's hoped that it will stimulate interest in wildlife conservation.

In Osprey!, you are in charge of protecting the precariously small osprey population, using your wardens to defend the birds from egg-stealers, hunters and thoughtless tourists. The program comes complete with a fully illustrated

MORE ON MSX

With the arrival of the 'season of mists and mellow fruitfulness' and still no MSX machines on the market as we go to press, the best we can offer is an update on the specifications of both the Sanyo and Toshiba machines. Sanyo's MSX machine, the MPC 100, will offer 10 function keys, full cursor control and a light pen facility and comes complete with a two metre length of television connection coax cable and a cassette lead with eight-pin DIN plug and three mini jack connectors. External connections to the

32 page booklet on the osprey and describes the hazards facing them when they returned to Scotland, where the game is set. There are 10 skill levels in the program and at the end of each season, you can check how successful you have been compared with the actual number of migrating ospreys recorded by the RSPB.

Osprey! is available for the BBC, and Electron and Amstrad CPC 464 at £9.95 and on disk at £11.95 (5¼") and £15.95 (3") for the BBC only. Further details from BES at Bourne House, The Hundred, Romsey, Hants SO5 8BY (phone 0794 523301).

NEWS

MPC 100 include a 50 pin data connector, a Centronics parallel printer port and PAL composite video and audio outputs. A BASIC programming manual and MPC 100 operating manual will be included in the price of £299.95 and available add-ons will include a joystick and lightpen and cartridge adaptor, priced at £12.95 and £89.95 respectively. Further details from Sanyo Marubeni (UK) Ltd, 8 Greycaine Road, Greycaine Estate, Watford, Herts WD2 4QU (phone 0923 46363).

Toshiba's HX-10 also supports 16 colours for hi-res graphics but can also offer eight octaves and a triple chord facility to provide for every budding Vangelis. Toshiba also offer a range of peripherals, including joysticks and a 105 cps printer. The HX-10 will be priced at approximately £280. More from Toshiba (UK) Ltd at Toshiba House, Frimley Road, Frimley, Camberley, Surrey GU16 (phone 0276 682256).

KIT COLLECTION

The new, improved Cortex II, the 16-bit kit computer from Powertran is now available at a starting price of £299 (plus VAT). The standard Cortex comes equipped with interfaces for cassette, television and RS-232C as well as resident BASIC and a built-in assembler/disassembler. Improvements take the shape of a new slim cabinet and available extras such as interfaces for RGB, floppy disks and an E-Bus expansion port. Kits are available for a Centronics interface card for the E-bus.

Professional business packages, games and programming utilities are being marketed for the Cortex and users can seek advice and ideas not only from Powertran but also from the Cortex Users' Group. Further details on the Cortex II are available from Powertran Cybernetics Ltd, Portway Industrial Estate, Andover, Hants SP10 3BM (phone 0264 64455).





JUPITER REJUVENATED

To dispel any rumours to the contrary, Boldfield Ltd Computing have announced a complete range of accessories and software for the Jupiter Ace micro to prove that it is still alive and kicking. These include 16K RAM packs, video monitor connectors, and joystick interfaces, replacement keyboards and

components, motherboards and soundboxes, and software that ranges from arcade games to spreadsheets and an assembler/disassembler. The Jupiter Ace 3K RAM computer and power supply unit costs £26 plus VAT. Prices for accessories and software are obtainable on request from Boldfield at Sussex House, Hobson Street, Cambridge (phone 0487 840740).

MTX MYSTERIES

Level 9 have announced versions of their complete range of adventure games for the Memotech MTX500/512 micro. Colossal Adventure, Adventure Quest, Dungeon Adventure, Snowball and the Lords of Time can all be bought for £9.90 direct from Level 9 or from Memotech dealers. Further details from Level 9 at 229 Hughendon Road, High Wycombe, Bucks HP13 5PG (phone 0494 26871).

ASP FIGHTS THE PIRATES

Much has been said and written in condemnation of software piracy but few have taken a positive stand against it. ASP is among those few that have taken action to help curb the grave problem of home copying of commercial software.

ASP has already taken steps to eliminate advertisements in our magazines which relate to tape duplication for piracy purposes. While it is appreciated

that individuals may take 'back-up' copies of their own programs, it should be noted that it is *ILLEGAL* to copy commercially available software for other than personal use.

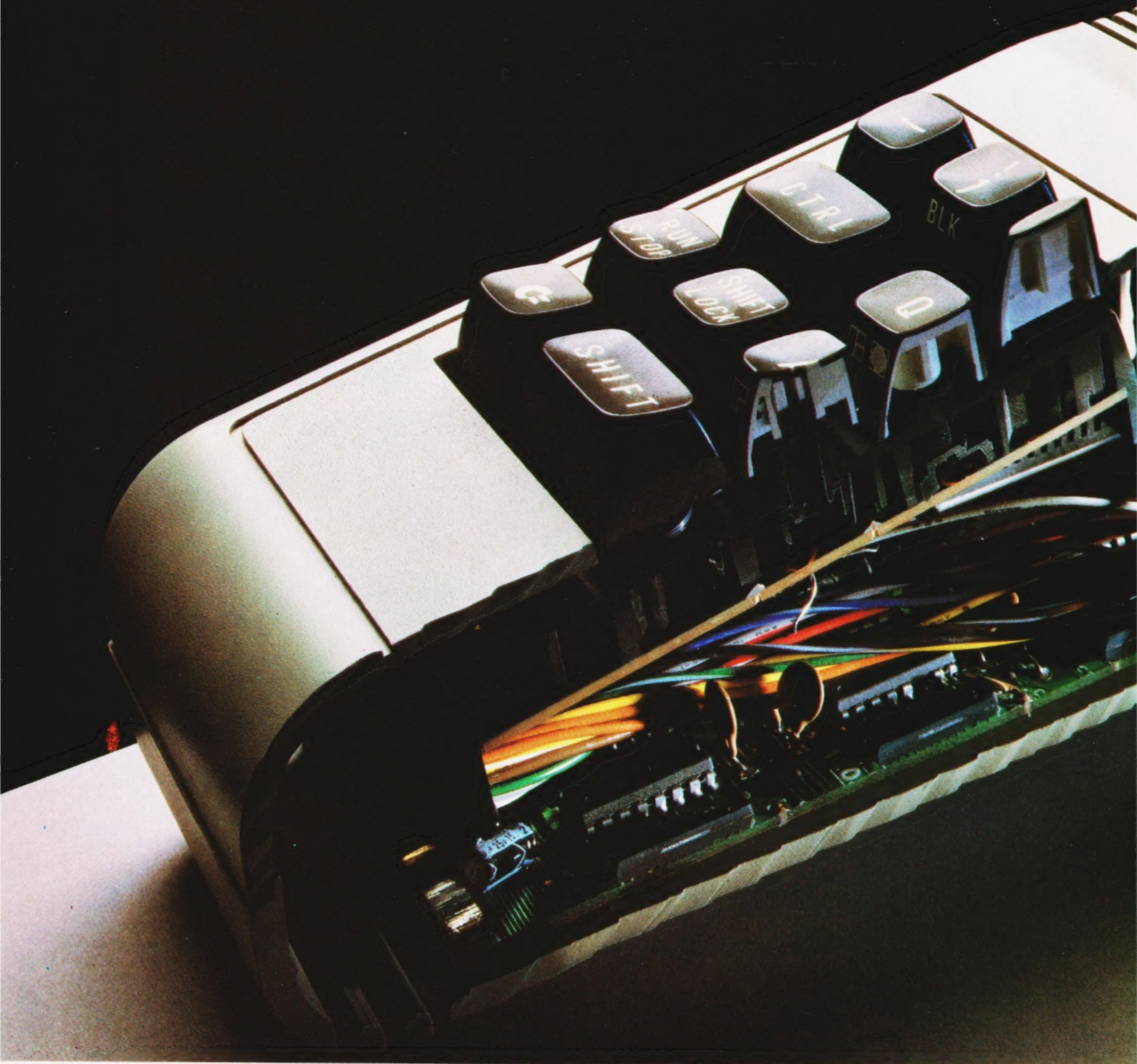
Software piracy is costing the software industry huge sums of money which is detrimental to the future development of the industry. It is in everybody's interests to dramatically reduce the level of software piracy primarily because firms need funds raised from software sales to plough back into research and development of new products. This means that the standard of software products can only improve.

ASP hopes that our action will help combat this serious problem in order to maintain and improve the high standards of the UK software industry. We are asking you to do the same by refraining from duplicating or copying commercially available software for anything other than personal use.

SIR FOR SEVEN

If you sorely miss the Mode 7 screen display on your Electron then Sir Computers may be able to provide an answer. The Mode7 Adaptor is a plug-in unit that bolts on to the back of the Electron: the expansion edge-connector is continued from the back of the Mode 7 unit so you can attach other modules, and there are also outputs that allow it to connect to standard RGB and monochrome monitors. Sir's Adaptor provides colour teletext graphics with 78 by 75 pixel resolution. Up to eight colours can be on screen at one time and it also can support flashing and double-height characters. The text display allows 40 by 25 characters and uses 1K.

The Mode 7 Adaptor is compatible with all BASIC and OS commands and over 90 per cent of Beeb Mode 7 software. For more information, contact Sir at 91 Whitechurch Road, Cardiff CF4 3JP (phone 0222 621813).



Are you only using

To play only games on a Commodore computer is like asking Albert Einstein to work out the square root of four.

The computer's brain barely ticks over.

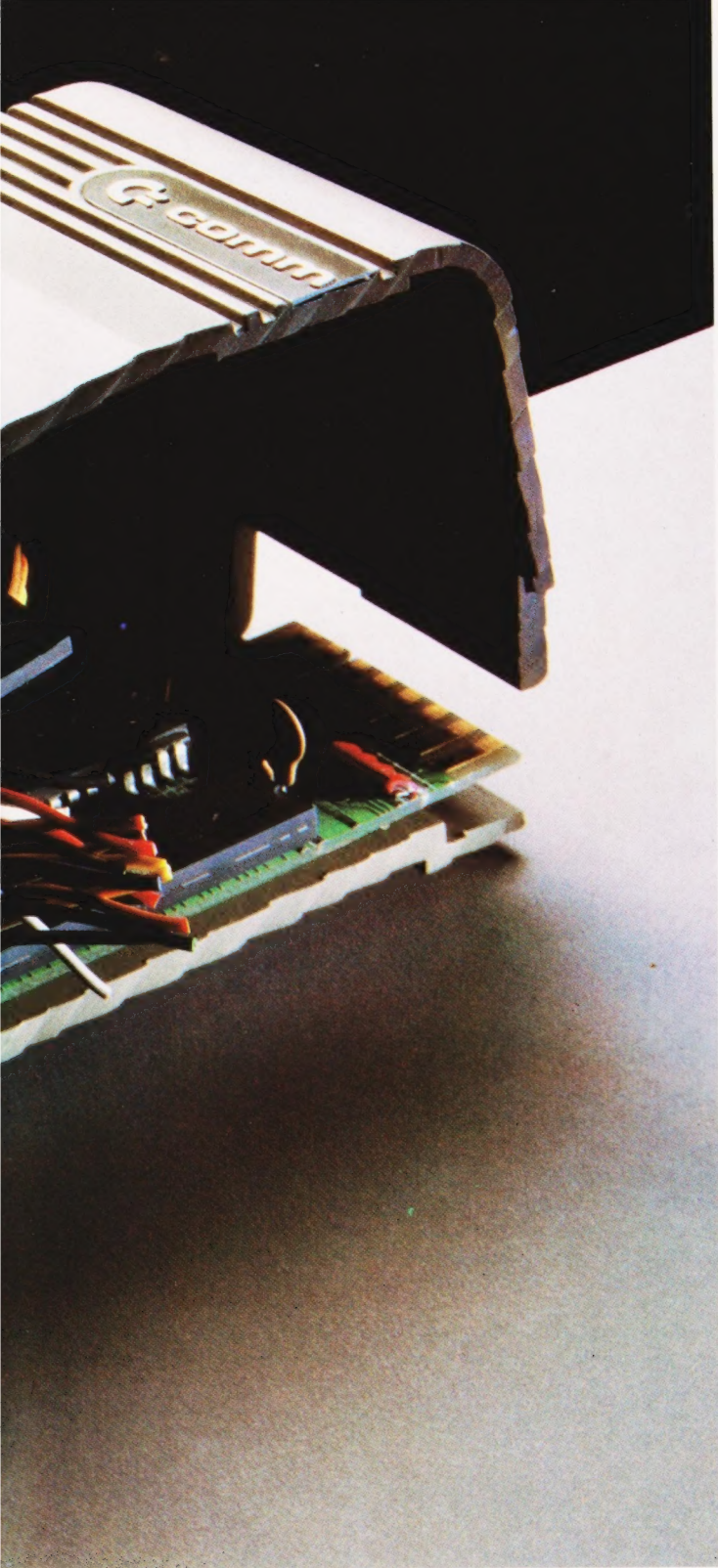
To really stretch it, you need more interesting software programs. For example, record keeping, interactive education, stimulating adventure games or word processing.

And for these you need peripherals.

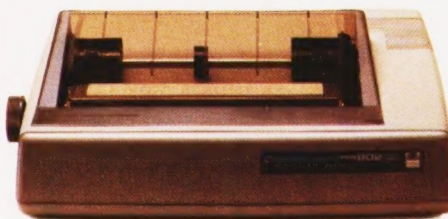
Like a Commodore disk drive, a really fast storage and retrieval system with a vast memory.

Or a Commodore cassette unit, the inexpensive way of loading and storing programs.

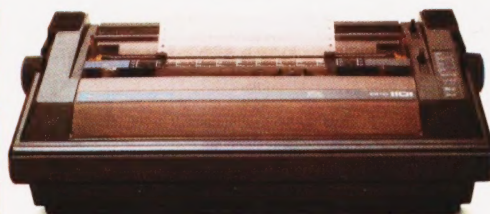
For those who like the idea of text and graphics being more alive and having greater clarity than on a TV, there's the Commodore colour monitor.



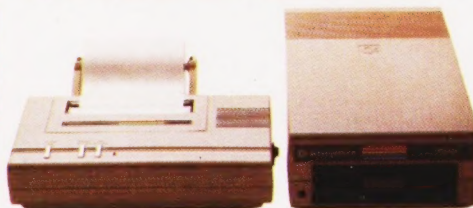
COMMODORE MPS801 ☐
Dot matrix printer. £230.00.
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50 characters per second.



COMMODORE MPS802 ☐
Dot matrix printer. £345.00.
Friction feed for standard
paper. Print speed:
60 characters per second.



COMMODORE DPS1101 ☐
Daisy wheel printer. £399.99.
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all types of paper. Print speed:
18 characters per second.



COMMODORE 1520 ☐
Printer plotter. £169.99. For
charts and graphs. Print speed:
14 characters per second.

COMMODORE 1541 ☐
Disk drive. £229.00.
170K memory. 5 1/4" diskette.



COMMODORE 1531 ☐
Cassette unit. £44.95.
For Commodore 16 and
Commodore plus/4.

COMMODORE 1530 ☐
£44.95. For Commodore 64.



COMMODORE 1701 ☐
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FOR FURTHER INFORMATION, TICK ONE (OR MORE) OF THE BOXES ABOVE AND SEND TO THE COMMODORE INFORMATION CENTRE, 1 HUNTERS ROAD, WELDON, CORBY, NORTHAMPTON NN17 1QX. TEL: CORBY (0536) 205252.

NAME

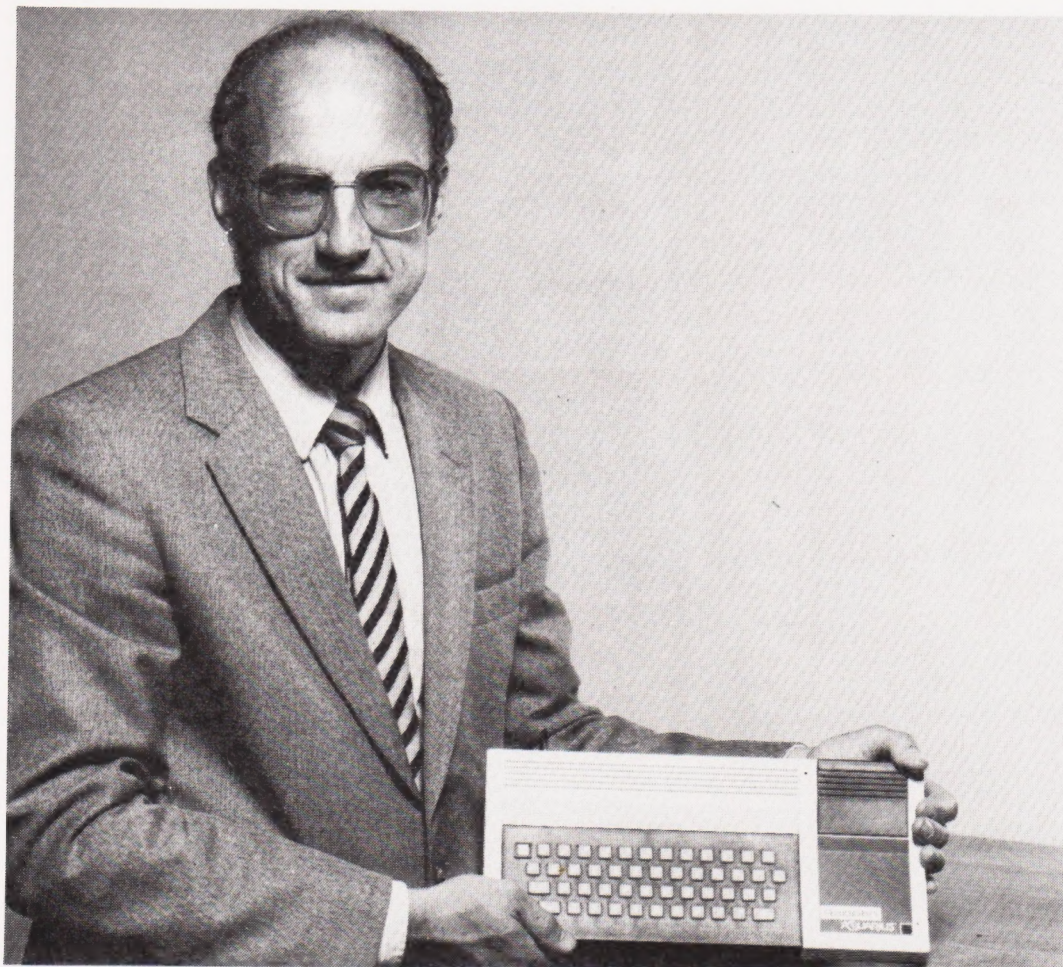
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THE AGE OF AQUARIUS

Not to be outdone, the Aquarius has recently been relaunched at a recommended price of £49.95 by Radofin Electronics. Mike Quelch, Radofin's newly appointed sales director calls the Aquarius I "an unbeatable micro in this price bracket". It offers 16 colours and a graphics resolution of 320 by 192 pixels and connects to a television set. Documentation is included in the package and there is a range of home management, educational and games software available on both cassette and cartridge. For more information, contact Radofin Electronics, Hyde House, The Hyde, London NW9 (phone 01 205 0044).

MACINTOSH MULTIPLES

With the heady arrival of the Macintosh in Britain, Apple are ensuring that it is well supported with the release over here of several US software products, handpicked for the UK by Phil Peters, manager of Apple (UK)'s Software Business Unit.

Filevision, manufactured by Telos Products costs £159 and is a "visual filing system" that uses pictures to make information management a bit easier. PFS:File is for recording, retrieving, updating and printing information and PFS:Report transforms the information into presentation quality-tabulated reports, mailing labels and so on. PFS File and Report cost £89 and are compatible with the Mac's wordprocessor, MacWrite.

Microsoft Chart, at £99, is a business graphics program that can interpret numerical data into forty different types of graph including area, bar, column, line, pie, scatter and combinations. Other programs available include Habadex, a data base to handle lists, reports, labels and customised letters and MacCash, a program that enables you to set up a cash book to specific requirements. Habadex and MacCash are priced at £159 and £175 respectively and, like all the other programs, should be available through your local Apple dealer. According to Phil Peters, this initial launch is just the tip of the iceberg, with a proposed 150 Macintosh programs on the market by the end of the year.

FAMILY PLOT

Bel Tech have recently released Bel Plot and Bel Subs, two new utilities, and updated two existing programs, Bel Gen and Bel Base, all for the BBC. Bel Gen, on disk, is a specialist program for those who have always wanted to dig back into history and unearth distant ancestors. As a medium for storing all the details, Bel Gen can be of considerable use with options such as the drawing of a Male/Female line tree and additional fields for dates of marriage, wills and notes. You are able to format your own report using SEARCH and SORTING on any field and you have random access of data on disk with up to 600 people/file on 80T (375 on 40T). Bel Gen on disk costs £17.

Bel Base, Bel Tech's data base has also been updated to cover 480 characters/record, with up to 20 fields/record. Bel Base includes Mailshot and is compatible with Bel Graph — the complete package costs £18. The updated versions of both programs can be obtained for £4.50 and free of charge, respectively to existing users.

The two new releases are available on both tape and disk. With Bel Plot you are able to plot graphs from data entered via the keyboard or a file. Equations can also be entered and plotted. Other options include automatic scaling and positioning of axes and edit facilities. Tape and disk versions will cost £9.50 and £11.50 respectively. Bel Subs contains an assortment of sub-

routes for programmers. These include routines for drawing graphs and bar charts as well as various sorts and character and envelope generators. Bel Subs will cost £10.50 for the tape version and £12.50 on disk. For further information, contact Bel Tech at Stanmore Industrial Estate, Bridgnorth, Shropshire WV15 5HP (phone 07462 5420).

GEMS ON THE AMSTRAD

Slowly but surely, software is appearing for the Amstrad CPC464. Some of the more recent releases include a colour graphics adventure and a non-violent simulation game, both from Kuma. In Gems of Stradus, your quest is to find a casket of gems, evading the inevitable guardians and finding your way through the maze of over 100 rooms. It is the first of a series of adventures that Kuma plan for the Amstrad.

The other program is Holdfast, a strategy game. Holdfast is the name of the village where you live, in the land of Dictatoria. For

years the villagers have been paying taxes but have received no aid in return. Now things are in a desperate state, and the village urgently needs a clinic and a school. It's your job to persuade the government to reconsider their budget, using means at your disposal — negotiation or strike and so on — but you cannot resort to violence because of the government's superior strength.

Gems of Stradus and Holdfast will cost £7.95 and £5.95 respectively and are available from Kuma or retailers. For more information, contact Kuma at 12 Horseshoe Park, Pangbourne RG8 7JW (phone 07357 4335).

GNOMINALLY DIFFERENT

Two new software packages have recently been released for the BBC from Gnomonica, a company that specialises in utility and scientific software. DAP1 and DAP2 are data analysis and curve fitting programs available both on cassette and disk at £15 and £20 respectively. Graphs and functions can be produced and optionally dumped to Epson printers and both programs can be interfaced to your own data analysis programs.

If machine code is your speciality then it could well be worth investing in Mach1, a utility for machine code programmers that features a combined assembler/disassembler. Mach1 is normally supplied in a 16K EPROM at £39.95 but there is also a version on disk for sideways RAM and second processor users, priced at £19.95. For further details, contact Gnomonica at 2 Stable Cottages, Pleystowe, Rusper Road, Capel, Dorking, Surrey (phone 0306 712317).

BOARD SIDEWAYS!

If you're fed up with having to open the case of your BBC whenever you want to change the ROM, you could be pleased to hear of a recent release from Micro-Z — an external sideways ROM board. This can be bought to be used either inside

PETITE PRINT

At the Acorn User Show recently, Phi Mag Systems launched their new, miniature thermal printer, the PhiPrint. With dimensions of 8 by 17 by 20.5 cm and weighing just less than 1kg, the printer has a full character set of 96 UK ASCII with descenders and standard, elongated and condensed character modes that print 40, 20 or 60 cpl. For graphics printing the PhiPrint outputs 256 by 8 dots per line and has a print speed of about 0.47 lines per second.

The printer interfaces to the BBC or Electron via a standard Centronics-type 8-bit parallel interface and costs under £100. For further information, contact Phi Mag Systems at Tregonigie Industrial Estate, Falmouth, Cornwall TR11 4RY (phone 0326 76060).



or outside the BBC and fitting the system involves no soldering. Two circuit boards are used which are common to either the internal or external board. In both systems the CPU board is mounted internally by plugging into the 6502 socket, but should not occupy any space needed for other BBC upgrades such as RAM extensions.

Micro-2 are hoping to release upgrade modules for the system that will provide RAM expansion and a combined EPROM eraser/programmer. Further details from Micro-Z, PO Box 83, Exeter EX4 7AF.

WHAT'S UP DOC?

A recent package from Acorn marks a distinct change of direction and their first direct move into what they term Britain's "potentially lucrative medical market." The £1999 package was developed by two practising GPs and comprises a disk-based Beeb with monochrome monitor, printer and built in WP program, and specially written software. It is aimed at GPs who want to automate time-consuming work such as repeat prescriptions and patients' record-keeping. Acorn esti-

mate that there should be a wide market for their Doctor's package: of some 8000 practices in this country, as yet, only about five per cent use computers.

They are obviously confident that there is a need for a package of this kind and have plans for other programs for the BBC that will handle financial administration and records such as drug usage statistics and an age/sex register for automatic recall of patients. There are also plans afoot for similar packages for dentists and opticians (and chiropractists?).

The Acorn Doctors Package is available by mail order only from Vector Marketing Ltd, Dennington Industrial Estate, Wellingborough, Northants NN8 2RL.



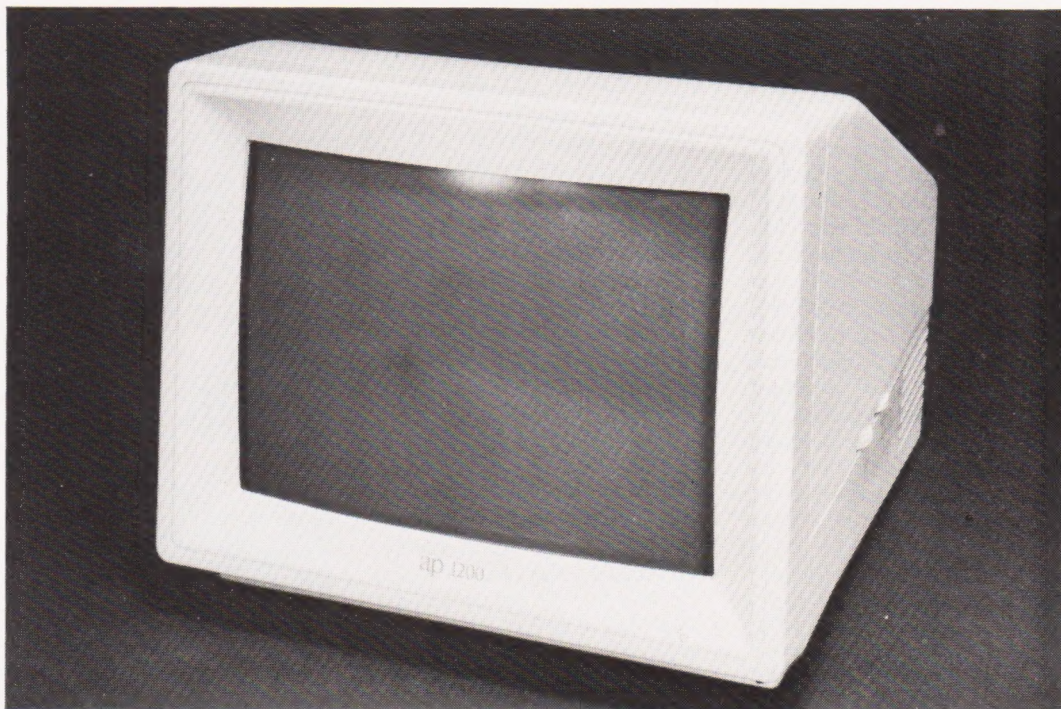
ADAPTABILITY

As a sequel to their Video Output kit, Adapt Electronics have launched an RGB Output Driver module for the Spectrum. This will enable the Spectrum to interface to any RGB (TTL) monitor for a price of £29.95 (plus postage). The module is fitted without any need for modification or internal connections to the Spectrum by plugging into the expansion port and it does not affect the UHF output.

For further details, contact Adapt at 20 Starling Close, Buckhurst Hill, Essex IG9 5TN (phone 504 2840).

MANITRON MATCHING MONITORS

For those who like coordinated hardware, the AP1200 Apricot compatible 12" monitor is now available from the Manitron Division of Ficention Ltd. There are two versions, the AP1200 to match the standard Apricot and the AP1200 xi to match the Apricot xi. Both use a 90° green phosphor tube with P39 long persistence phosphor and anti-glare etch and operate from the Apricot 12V supply via the standard 9-way D connector. The AP1200 measures 31 by 26.8 by 34.4 cm and weighs 5.4Kg. The prices are £179 for the free-standing monitor and £195 with the swivel and tilt base. Further information from Ficention Ltd, Manitron Division, Sanbach, Cheshire (phone 093 67 4171).



DRAGON GOES...

It seems that Dragon computers have finally abandoned the Welsh countryside for the sunnier climes of Spain. Eurohard SA have purchased all the assets of Dragon Data Ltd and intend to manufacture both the 32 and 64 micros as well as future Dragon products on a world-wide basis. Further details from Touchmaster Ltd, Kenfig Industrial Estate, Margam, Port Talbot, West Glamorgan SA13 2PE (phone 0656 744700).

NO BUTTS

Good news for BBC owners who feel in need of a little extra room: Aries Computers have cut the price of their Aries-B12 RAM expansion to £79.95.

At the same time, Aries have also launched a sideways ROM expansion system, the Aries-B12 and are looking towards an enhanced disk system as the next "logical step". The moves come as part of Aries' new sales campaign but are also probably designed to counter-attack the production of "cheap

imitations" of the Aries-B20. According to managing director Peter Headland, this "bare-faced plagiarism" contravenes their Patent Application and they intend to press for damages.

HONG KONG ON LINE

If you happen to be in Hong Kong in the near future, why not pop into the Asian Computer Plaza for a copy of the latest CT.

The Plaza is Asia's first computer centre and comprises a shopping arcade and exhibition and educational facilities. The centre will be open from 10am to 8pm seven days a week and it's hoped that it will exhibit the latest in hardware and software as it appears on the international market. Services will include specialist book stores, and facilities for disk-to-disk conversion and computer rentals as well as a hotline enquiry service and information desk.

If you're travelling to the Far East and would like some further information, phone the Hong Kong Tourist Office on 01 930 4775.



INGERSOLL INCREMENT

Heron Electronics, who manufacture Ingersoll home electronics products, have added a new baby to the range. The XK696 data recorder has been designed specifically for computer use and includes separate load and monitor level slide controls, power on, save and signal LEDs as well as auto-stop, pause, tape counter and cue/review. The XK696 is compatible with most popular home computers and costs £40.95 from high street electrical stores. For more details, contact Heron Electronics at Heron House, 19 Marylebone Road, London NW1 5JL (phone 01 486 4477).

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NEXT MONTH

Computing today

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NOVEMBER 9th

Next month Computing Today concentrates on glorious graphics. We'll be featuring a lengthy review of the amazing Acorn Bitstik for the BBC Micro, which effectively gives you a £2000 CAD system. On a more frivolous note, we'll take a look at Acornsoft's Elite, a space adventure game with real-time 3D graphics. There'll be an article on the stunning things you can do with the Pluto system from IO Research, a review of the Koalapad graphics tablet for the CBM64, and a type-it-in listing of a graphics drawing program for the Amstrad. If you don't have an artistic bent, though, we'll be reviewing the GRiD Compass and the Psion Organiser — two pieces of hardware at opposite ends of the portable market.



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Articles described here are in an advanced state of preparation but circumstances may dictate changes to the final contents.



ORIC AND SINCLAIR COMPUTERS

Oric 1 computer 48K £95 (£92) £102.
Oric Atmos computer 48K £171 (£158)
£168. Oric colour printer £134 (£123)
£140. Oric disc drive £304 (£278) £298.
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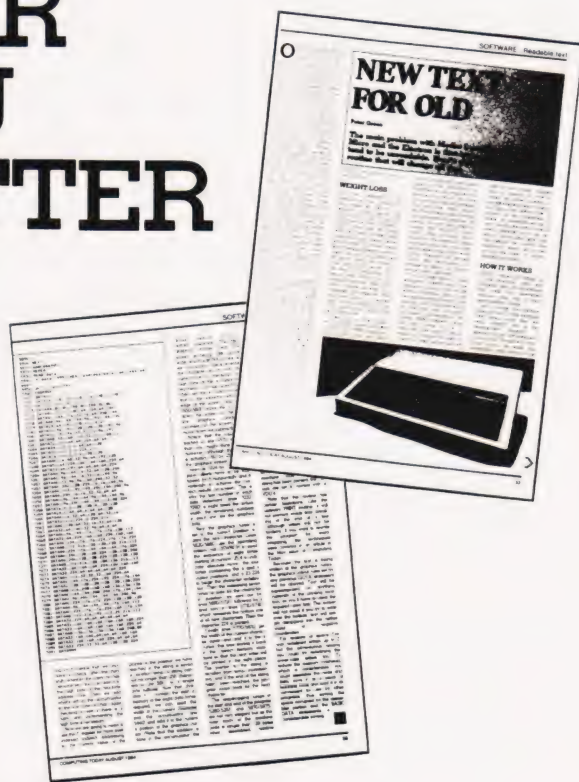
If you're interested in making your hobby pay its way and you've written a program that you think suits the magazine's content, why not send it to us today with the form below (or a photocopy of it). The address is *Computing Today*, No. 1 Golden Square, London W1R 3AB; and please mark your envelope clearly 'PROGRAM SUBMISSION' so that it doesn't get confused with all the other mail we receive.

We will need a copy of your program on cassette (or disc, for some systems, if you prefer) together with clear documentation on what it does and how it does it, including a list of the major variables, and if possible some indication of how a conversion to other micros might be attempted. We would appreciate a listing of the program and any screen dumps that you feel might be useful, but not on ZX Printer paper (it doesn't reproduce very well in the magazine). Remember that CT is a general computing magazine and accepts articles for any popular computer including Commodore, Acom, Atari, Sharp, Amstrad, Sinclair, Oric, Tandy and Genie models.

If you would prefer to make a tentative approach to see if we are interested in your program *before* you put a lot of

effort into it (or to check whether we have discs for your particular machine), then that's fine too, provided it is understood that a full write-up will be required before we can publish.

Subject matter can be as broad as you like, bearing in mind that the more readers it will interest, the more likely we are to accept it. A brilliant business program that requires the simultaneous use of four disk drives probably won't be accepted! Also we tend to steer clear of simple arcade games unless, like our Frogger, they demonstrate how to use a particular machine's capabilities to the full.



PLEASE COMPLETE IN BLOCK CAPITALS

Your name:

Your address:

.....

.....

Telephone number:

Program name:

Computer/memory size it runs on:

Amount of memory program occupies:

Any special peripherals required? (joystick, discs, printer (etc):

Have you sent your submission to another magazine?

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Early Evening 6.40 pm Orion Quest

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Screen play N. White
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Mid-evening

9.00 pm Quest for Eternity

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Written by David Cockram
Directed Martin Edwardes
Produced Argus Press Software

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Midnight Movie

11.55 pm Star Force Seven

Starring The Zurgs
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The microcomputer industry was created by three companies — Digital Research, Commodore and Apple. Digital Research and Commodore are alive and kicking in a new world of corporate strategies. Apple, somehow, retain an image of goodwill and striving perfection.

One might compare Apple with IBM — both companies have the capacity to challenge our ideas of where the business is going (how many other manufacturers can say the same?). In a sense, Apple proved themselves by taking on the mantle that Xerox initiated through 'Smalltalk' and the 'Star' 8010 workstation. If an organisation with that approach to future systems decides to resurrect their older products in a new guise, the world has to sit up and take notice.

The Apple 'IIC' is the first stage in that resurrection, a single drive, compact version of the well-established 'IIE' system, which costs less than £1000 — an important consideration in the UK market which is now largely bracketed at increments of only £500 (hardware price). For the same amount you can buy a Sanyo (partially IBM PC-compatible) machine with a number of bundled programs from Micro-Pro (authors of the WordStar text editor).

So, who wants to buy this machine, based on the apparently obsolete 6502 processor? Perhaps the 'high technology' buffs among us are in danger of missing the point — most purchasers are only interested in two things: the quality of the machine and the range of software available. The Apple IIC scores strongly in both areas.

SOFTLY, SOFTLY

The range of software is quite fantastic. While the vendors of today's Intel 8086-based products are lucky if they can amass 1,000 programs which will run on their hardware, Apple can claim over 10,000 fully developed third party products — perhaps nearer to 20,000. We have examined this issue in previous articles, but it's worth repeating: old software costs less and carries fewer bugs than new software. Speak to any data processing manager if you doubt this.

This range of usable pro-

grams is claimed as one of the major selling points for the IIC. Does this claim stand up to a closer examination? Much of the software is very old indeed. It uses only forty columns of the screen and perhaps isn't written and documented in quite the way we expect nowadays. Furthermore, it runs under the old DOS 3 series, so it loses the speed advantages of Apple's new ProDOS and Pascal

on price grounds. We already have a wide range of machines for home use, which probably offer better value for money than the IIC — and have a pretty respectable range of mature programs.

Of course, Apple have vast experience of machines for educational use, and deserve warm applause for their two 'teaching' languages: Logo and Pilot. Logo is steadily becoming more popular

statement followed by conventional PRINT statements, and Mouse co-ordinates are simply read using the INPUT statement preceded by the appropriate redirection. This is a valuable aid to development and debugging which other dialects of BASIC would do well to emulate.

Incidentally, whoever wrote the Mouse demonstration programs in the Apple documentation should be shot (or

ANOTHER BITE AT THE APPLE

Simon Dismore

Apple Corporation aim to re-establish their once dominant position in the market with four products — the Lisa, Macintosh, Apple Compact and Apple Extended machines. The new IIC marks the third phase of this well-planned campaign. We wondered who would buy it...

operating systems.

So it looks as if much of this existing software would only be interesting to specialised users. This reflects the positioning of the machine (in the US at least) as an excellent system for students. Apple's theory is that they can create an army of young adults who will remain loyal to the Apple brand in years to come. To this end, their documentation contains a number of full colour photographs of children and students. The best tear-jerker shows a homely grandfather looking on in fascination while his all-American High School grand-daughter demonstrates the IIC. You can also choose from images of grandad taking the toddlers off fishing, and the rising young executive relaxing in the garden with his 2.2 children. Interestingly, women aged over 25 do not seem to exist in Apple's schmaltzy new society.

It's hard to believe that this approach will strike a chord with the UK market. There is little possibility of British students finding the IIC an acceptable purchase, simply

(Digital Research now offer a version, DR Logo, for the IBM PC) because of its simplicity and power. It offers 'turtle' graphics which can be used to introduce concepts of vectors and geometrical transformations at an early stage in education. Logo is highly structured in the sense that programs are built almost entirely out of procedures, which are built from other procedures, and so on, thus making good programming practice both fun to learn and easy to follow. 'Pilot is a specialised facility for constructing interactive teaching packages, and has been a little slow to take off on this side of the Atlantic.

MOUSE MATTERS

Applesoft BASIC (provided in ROM on the machine) is probably best ignored for the simple reason that variable names can only be two characters long, and you can't teach programming that way. However, it does allow PRINT and INPUT to be redirected between different devices. Thus, LPRINT is replaced by a redirection

condemned to 15 years hard labour unravelling tepid spaghetti). GOTOs cross over each other, the same literals (eg CHR\$(4)) are used many times instead of being slotted neatly into a variable at the start of the program, and single routines have multiple exit points. The resulting code is hard to understand and almost impossible to modify.

Apple supply a design package (MousePaint) with the Mouse which offers some of the facilities of the Macintosh MacPaint application. You can use this to create simple diagrams and freehand graphics, though you would need Apple's ImageWriter printer to reproduce your efforts on paper. While MousePaint is fun to use (and remarkably fast, considering the slow CPU at the heart of the system) it really cannot compare with the Mac's product. In practice, the facilities for editing the drawing and for adding text are not quite sufficient for serious work. This, of course, gives your friendly Apple dealer a marvellous opportunity to sell you a Macintosh only a few months later!

The quality of the documentation (example programs aside) is quite superb. The text is clear and remarkably succinct, and diagrams and photographs are used at every stage to make things clear to the reader. A set of training disks come with the system which (tongue firmly in cheek) explore the basics of the IIc fairly thoroughly, though some training on the ProDOS operating system (which receives only cursory attention from the standard documentation) would probably help the user who wants to start programming in a modest way. Nevertheless, Apple certainly deserve congratulations for the thoroughness of their material.

The Apple documentation is already being complemented by books on the machine from third-party publishers. Simon & Schuster, the US publishers, have collaborated with Apple on **Going Places With The New Apple IIc — All You'll Need to Know to Get There**, which adds useful technical information about the inner workings of the machine. Over here, Pitman Books have produced **Introducing the Apple IIc** (by Friedman Wagner-Dobler, technical director of Busisoft). This is rather less technical and in some ways rather more objective about the product's advantages for different applications. The Pit-

man Book (page 95) reproduces Apple's estimates of the popularity of the system, expressed as the length of time taken to sell 50,000 machines:

Apple II (March 1977):
2½ years
IBM PC (August 1981):
7 months
Macintosh (January 1984):
74 days
Apple IIc (April 1984):
1 day

It is worth commenting that none of these business machines relied upon the unfortunate direct response selling methods which we tolerate in this country.

BUSINESS POTENTIAL

What about the IIc as a business machine? With only 143K available on the single integral disk drive, any large scale processing of accounts or databases would be a very frustrating experience — and though a second drive is good value at £230, it does push the price up into the range of more powerful machines. The best fit for the system is probably as a "management support" facility. It's hard to define exactly what this means, but most people agree that intermittent uses of word processing, data bases and spreadsheets are the key feature. Some call this sort of system a "desk tool" — a sort of



The sleek Apple IIc, displaying a Mousepaint frame.

FACTSHEET

| | |
|---------------------------|--|
| | Apple IIc System Unit (requires monitor or TV) — £925 |
| CPU | CMOS 6502 |
| RAM | 128K standard, not expandable |
| Language | Applesoft Mouse BASIC in ROM |
| Dimensions (HxWxD) | 9" Display — 5.2kg (193mm x 242mm x 258mm) System — 3.4kg (63mm x 288mm x 310mm) Power Supply — 1.5kg (68mm x 144mm x 74mm) |
| Display | 540 or 80 columns by 24 lines Low-res graphics through Applesoft BASIC Hi-res 560 x 192 in 16 colours |
| I/O | Serial printer/plotter interface (5 pin DIN) Serial communications interface (5 pin DIN) Apple Mouse/Joystick interface (9 pin D connector) Integral 143K 5¼" floppy drive Controller and interface for second drive Monochrome composite video output External modulator for TV |
| OS | ProDOS supplied with system DOS 3.3 (with utility to convert older programs) Pascal-based DOS |
| Options | Apple Mouse IIc — £70 Monochrome Monitor IIc — £167 Additional power supply for IIc — £27 Carrying case for IIc — £27 Expansion 5¼" Floppy Disk — £230 LCD full screen display (NYA) Imagewriter Printer and adaptor — £423 Apple Colour Plotter — £661 |
| Software | Apple Logo (128K version) — £75 AppleWorks — £175 MousePaint (free with Mouse) |

direct upgrade from a calculator or a card index. By this definition, we felt that the IIc scored quite strongly.

Our first observation was that the new machine was truly compact: to use the industry jargon, it has a small "footprint". Those of us who find it difficult to keep our desks in a condition even approaching tidiness will find this an important buying point. The machine is cooled entirely by convection, so there are no irritating fans to disturb the creative processes.

The keyboard is made to a very high standard, with the full ASCII character set including the UK '£' sign. The four cursor keys are arranged horizontally (West-East-South-North) to the right of the Space bar. Our only reservation was the small size of the Return key. There is no calculator keypad, but most of the likely applications for the IIc as a "desk tool" should be quite workable without one.

Apple's monochrome monitor has a 9" screen, offering

a rocksteady image in both 40 and 80-column modes, well up to the standard of the Apricot's monitor (and in some ways better, if you prefer a low-persistence phosphor). In normal use, you would mount the monitor on the optional stand. This costs £27, which is a lot of money for a hunk of painted cast iron. A cantilever arrangement of the sort used by Wang wouldn't cost much more to manufacture, and would certainly make it easier to move the monitor in and out of use.

For home use, the IIc comes with a TV modulator and a novel switch which selects either the computer or the aerial as the source of signals — a neat idea which eliminates the usual chore of unplugging cables. The monitor runs off the mains, while the system unit (like other compact machines) uses an external transformer to provide a 12 volt supply. The busy executive or commercial traveller would pre-

Appleworks integrates a spreadsheet, database and wordprocessor in an environment similar to a desktop, with pop-up folders and a chipboard for transferring information in word processor format.

The Appleworks tutorial program introduces these facilities in a brisk but friendly way. Typing errors are trapped (a) and a simple storyline (your application for a business loan) holds things together (b).

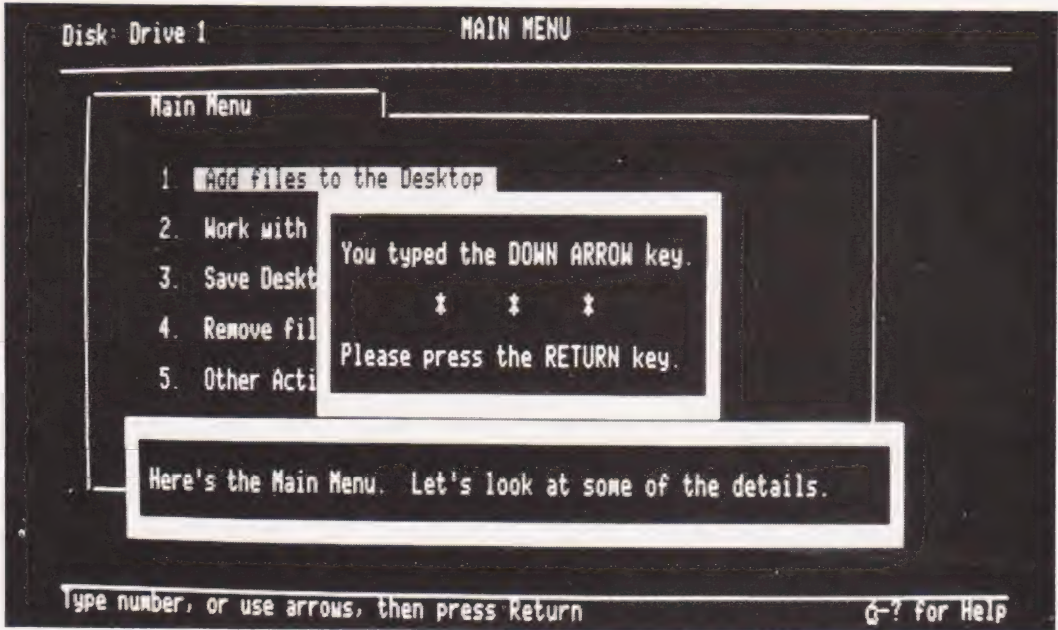
In the example, you provide your bank manager with a suitably edited list of customers (c) using Appleworks rudimentary database. Sales projections for the next few months (d) are adjusted using the spreadsheet, and the information is attached to the begging letter (e) via the clipboard (f) — a simple if somewhat inefficient form of integration.

sumably have two power supplies (£27 each, weighing a hefty 1.5 kg); one with the monitor at the office, and one at home or in the hotel, together with the TV modulator. Apple have also announced a 24 line LCD screen for the IIC, which should be available towards the end of the year. This, if matched with a 21 volt battery pack, would make the system much more portable, at least in theory ...

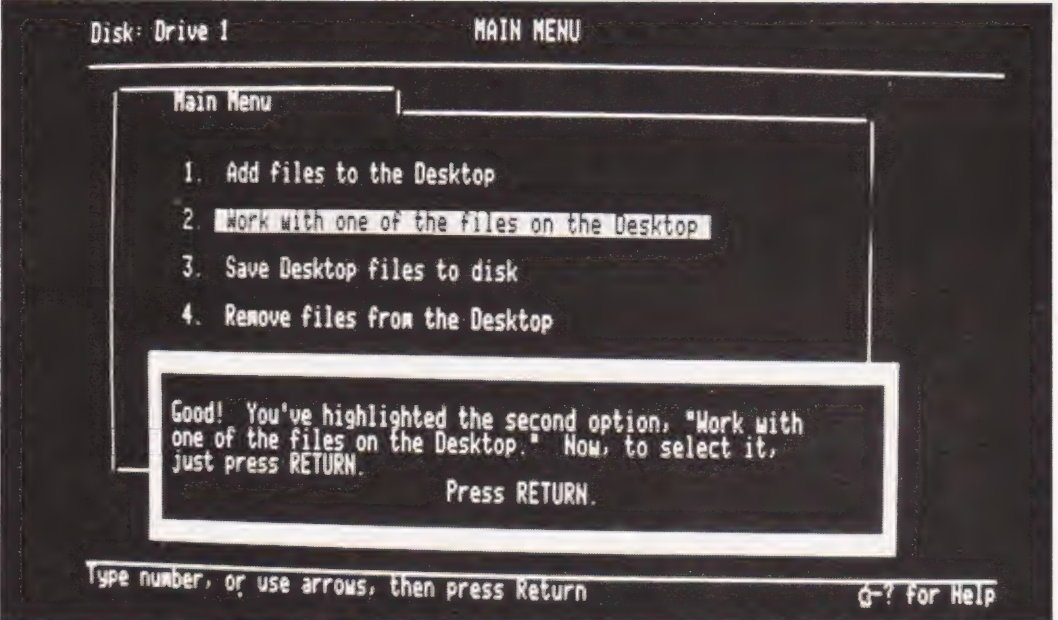
THE COMPLETE WORKS

For the business person, Apple offer an integrated program called AppleWorks, which incorporates WP, database and spreadsheet tasks into a pseudo-desktop environment with pop-up help screens. Once again, there is an excellent tutorial package which takes the novice through the various facilities. AppleWorks is simple to use and, for an eight-bit product, remarkably powerful. It doesn't offer graphics or telecommunications, but has almost everything else the average user might want from a "desk tool".

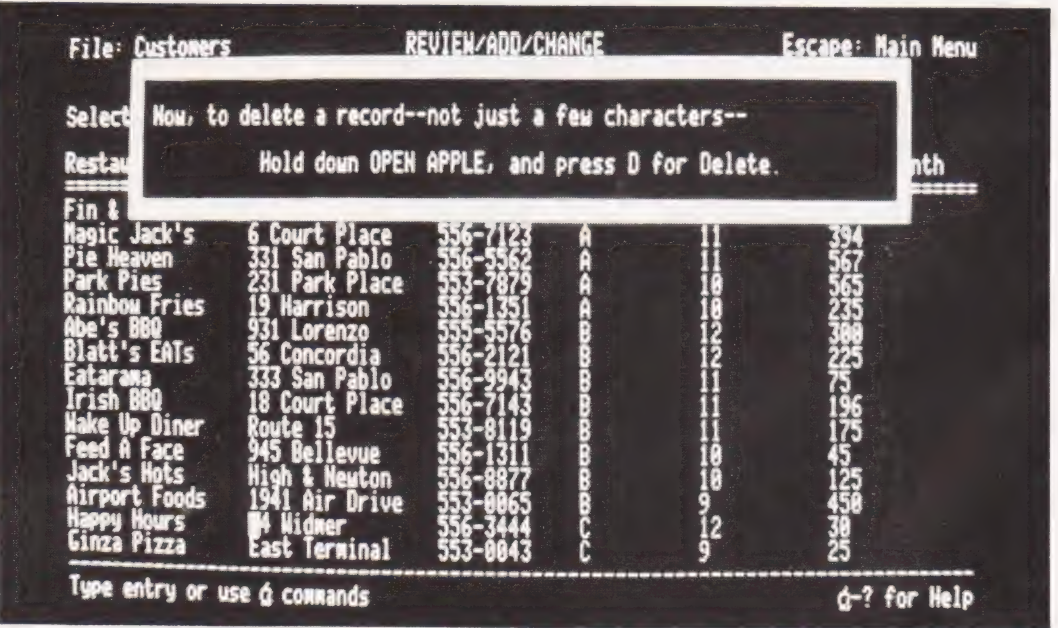
AppleWorks is really only integrated at the software level — true integration of data (which effectively makes



(a)



(b)



(c)

File: Organic Growth REVIEW/ADD/CHANGE Escape: Main Menu

File Pie Company: Growth in Organic Pie Sales (Projected)

| Pie | | Oct | Nov | Dec | Qtr |
|--------------|----------|-----|------|------|------|
| Yogurt Yummy | High | 720 | 1080 | 1620 | 3420 |
| | Low | 480 | 720 | 1080 | 2280 |
| | Expected | 600 | 900 | 1350 | 2850 |
| Ragamuffin | High | 120 | 132 | 165 | 417 |
| | Low | 80 | 88 | 110 | 278 |
| | Expected | 100 | 110 | 138 | 348 |
| Veget | | | | | |

You got it! Here are your projections of the growth in Organic Pie sales.

Alt: (Label) Now's App Type entry or use ⌘ commands ⌘-? for Help

(d)

File: Loan Letter REVIEW/ADD/CHANGE Escape: Main Menu

Dear Ms. Fowler,

We're applying for a construction loan of \$250,000 so that we can create a new manufacturing plant. In this letter, we'll outline our current financial status, our budget, and prospects.

We'll provide you with the details of our customers, our profitable new Lo Kal and Organic Pie lines and our payroll. We're sure that you'll agree we're really cooking!

Looks odd, doesn't it? DELETE pulls the text back to fill the gap left by the deleted characters. You use DELETE any time you want to delete a character to the left of the cursor.

Type entry or use ⌘ commands Line 9 Column 44 ⌘-? for Help

(e)

File: Or /Change

But you're cutting and pasting, so you want the clipboard. (The clipboard is a special place in the computer's memory; it holds one item you're moving).

Use the DOWN ARROW to highlight "The clipboard"; then press RETURN.

Where do you want to print the report?

1. Apple DMP
2. Image Writer
3. The clipboard (for the Word Processor)
4. A text (ASCII) file on disk
5. A DIF (TM) file on disk

Type number, or use arrows, then press Return 32K Avail.

(f)

every file a word processing file) would require considerably more disk space and processing power. Information can be moved from the database or the spreadsheet onto a clipboard, the contents of which can then be treated as a block of text ready for inclusion in a word processed document.

AppleWorks makes it easy to switch between tasks so that information can be brought to the screen and selected for the clipboard. This is perfectly acceptable for "one-off" letters and reports but the absence of any mechanism for automating this cut-and-paste chore struck us as a significant drawback for many popular applications. How do you incorporate addresses in direct mail letters, or incorporate standard monthly statistics in reports? Surely AppleWorks could offer some form of command language which allows the word processing software to retrieve information from the other tasks without user intervention.

A PRICE TOO HIGH?

Our final reservation about AppleWorks is the same as our worry about the IIc itself — it costs too much. To put together a workable business configuration which really takes advantage of the IIc features takes a budget of £1690 (plus £70 if you want the Mouse and MousePaint). For a single-drive system which has limited expansion capability (the IIc is a "slot-less" machine) this is a little high. There are plenty of manufacturers (Sanyo, ACT and Advance, for example) who can offer rather more power for the same price.

Manufacturers' prices can change in the twinkling of an eye, and there is no doubt that the Apple IIc is a well-designed system which will sell massively in the US. That means plenty of software and perhaps a few cunning additions. It isn't Apple's fault that the dollar is so strong against the pound, but, until that fact of life shows signs of changing, we think you would have to drive a hard bargain with your dealer to get value for your money.

You really can't go wrong with any Level 9 game as they are really brilliant

CRASH MICRO SEPT '84.

✓ Whichever machine you own, if you have the vaguest tendency towards adventure playing then you must try one of these games (unfortunately you'll probably end up wanting to buy the lot!).

Computing Today, August 84

✓ To me, all Level 9 adventures create a remarkable atmosphere because the descriptions sound so life-like. This is where so many other adventures fail.

Crash, July 84

✓ But it's not just the size of the game it's the quality as well that is astonishing ... scenes to fire the imagination.

PCG, April 84

✓ As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens.

Which Micro?, February 84

✓ (LORDS OF TIME). As we have come to expect from Level 9, the program is executed with wonderful style. Highly recommended.

PCW, 1 February 84

✓ I thoroughly recommend these Adventures, they are excellent value for money. No self-respecting Adventure-addict should be without them. I believe Level 9 are producing a series of Adventures which should be regarded as classics.

Atari User, July 84

✓ These programs run very fast and there are no frustrating pauses. Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Adventure is nothing short of brilliance; rush out and buy it. While you're at it, buy their others too. Simply smashing!

Your 64, June 84

✓ Level 9 — arguably the producer of the best adventure games in the UK — has done it again. LORDS OF TIME is a sparkling addition to its stable of winners.

Acorn User, July 84

✓ (SNOWBALL). This is another imaginative, massive-scaled immensely enjoyable adventure from those experts down at Level 9 Computing.

Your Computer, March 84

Return to Eden



Level 9 Computing

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Level 9's epic adventures are now here for the AMSTRAD. Disk versions are available for the BBC (40/80 track) and Commodore 64. And, best of all, RETURN TO EDEN is ready. It's been a busy month!

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Available from W H Smith and good computer shops everywhere. If your local dealer doesn't stock Level 9 adventures yet, get him to contact us or: Centresoft, Microdealer UK, Ferranti & Craig, Leisuresoft, Lime Tree, LVL, PCS, R & R or Wonderbridge.

AMSTRAD BBC CBM64 SPECTRUM MTX ORIC 1 LYNX NASCOM ATARI

The ability to move large amounts of memory from one ram location to another quickly, can be very useful at times, especially if the memory can be moved into lines within a BASIC program which can then be saved to tape or disc. The program described here has this feature as one of several memory relocation options.

Although it was written for the TRS80 Model I, Model III and Video Genie users should have no trouble using it. Moreover, the principles can be applied to any machine that stores its program lines in a format similar to that shown in Fig. 1.

FEATURES

Having a tape-based system, I have used the three redundant Disc BASIC commands, PUT, SAVE and LOAD, to perform the various memory movements. These three commands are used as follows:

- The screen or any other block of memory can be SAVED to REM line statements as hexadecimal strings and LOADED back again into RAM.
- The screen or any other block of memory can be PUT from one memory location into another. There are obvious limits here, of course. For instance, SAVING into ROM is impossible, while PUTting into the program area is suicidal unless done carefully (see

SAVE routine). No check is made to ensure that you do not commit suicide, so please be careful in your choice of destinations for memory blocks.

- Hexadecimal assembler code can be LOADED from REM lines into their working position in RAM.

- Machine code programs in RAM can be SAVED into REM

are now simple ways of adding features to Level 2 BASIC.

One way is to intercept the interpreter during one of its regular excursions into the RAM area from 41ACH to 41E2H. On tape systems, the interpreter does not stay long because it finds a RETURN instruction at each place it visits. Altering the RETURN to a

the interpreter encounters a LOAD statement, it dutifully makes its way to address 4188H where it finds C3 2D01. This tells the interpreter to jump to address 012DH. Off it goes to discover at 012DH yet more instructions that eventually lead to an L3 ERROR message. All we have to do to make use of LOAD is to poke into addresses 4189H and 418A the address of our routine. We can leave 4188H alone because we need the Jump. Now provided we have a RETURN in our user routine, everytime LOAD occurs in the program, the interpreter will go first to 4188H, then Jump to the new routine, execute it (hopefully!) and finally RETURN to where it would have gone originally had we not intervened! In a similar fashion, other disc commands such as PUT and SAVE can be altered to Jump to user machine code routines. Re-assigning addresses in this manner is known as revectoring in the jargon.

Hexadecimal Storage in REM Lines Several methods exist for passing data into memory from BASIC. Lines 106 — 111 (Listing 1) illustrate one commonly used alternative. Line 106 POKes the data in lines 107 — 111 into RAM starting at address -208 (65328 48K). Subsequently, once LOAD has been revectorred, whenever LOAD is encountered by the interpreter, it is directed via 4189/8A to this code in high RAM. While per-

MEMORY MOVES

Tom Ithell

If you've ever wanted to move large amounts of memory quickly from one RAM location to another, this article offers some sound advice on how to go about it.

lines for backup purposes.

- REM lines with hexadecimal strings can be CSAVED to tape for future use.

PROGRAM NOTES

Revectoring As is now widely appreciated by Model owners of tape based systems, there

Jump instruction at a convenient location in this area can send the interpreter to a user routine elsewhere, usually in high RAM.

Another method, the one used here, is to redirect the Level 3 Commands between 4152H and 41A9H. Taking LOAD as the example, when

| ADDRESS | CONTENTS | INTERPRETATION |
|---------|----------|------------------------------------|
| 17129 | 113 | LSB LINK ADDRESS POINTING TO 17265 |
| 17130 | 67 | MSB START OF NEXT STATEMENT |
| 17131 | 1 | LSB 2 LINE BYTE NUMBER |
| 17132 | 0 | MSB LINE 1 |
| | | 0 |
| 17133 | 147 | TOKEN |
| 17134 | 34 | ASCII CHARACTER |
| 17135 | 70 | ASCII CHARACTER |
| 17136 | 70 | ASCII CHARACTER |
| : | : | F |
| : | : | F |
| : | : | F |
| : | : | 128 BYTES EACH=ASCII 70=F |
| : | : | F |
| 17261 | 70 | ASCII CHARACTER |
| 17262 | 70 | ASCII CHARACTER |
| 17263 | 34 | ASCII CHARACTER |
| 17264 | 0 | END OF STATEMENT MARKER |
| 17265 | 249 | LSB LINK ADDRESS POINTING TO 17401 |
| 17266 | 67 | MSB START OF NEXT STATEMENT |
| 17267 | 2 | LSB 2 BYTE LINE NUMBER |
| 17268 | 0 | MSB LINE 2 |
| | | 0 |
| 17269 | 147 | TOKEN |
| 17270 | 34 | ASCII CHARACTER |
| ETC | | " |
| | | HOUSE |
| | | : |
| | | : |
| | | : |
| | | KEEPING |
| | | KEEPING |
| | | HOUSE |
| | | : |
| | | : |
| | | : |
| | | KEEPING |

Fig. 1 Program statement storage: how line 1 in the main program is stored.

Listing 1. The memory-moving program listing, plus some demonstration routines.

```

1 REM"FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFF"

*** CONTINUE ADDING REM LINES 2 - 31 AS LINE 1 ABOVE ****

32 REM"FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFF"
100 REM"F5D92AD3FED5BD5FF01800DD2AD7FF7EF50F0F0F0CDC2FFF1CDC2
FF23CD8FF280218EBDD28DDE5C1CD8FF281806081310FD01800018D778B1C9
E60FC530"
101 REM"FE3A3802C50712130BC9F1D9C90000000000000000F5D92AEFFED
5BF0FFED4BF2FFEDB0F1D9C9000000000000000000000000000000000000
00000000"
102 REM ***** INITIALISATION *****
103 CLEAR200:CLS:E$="...ENTER TO CONTINUE":AG$="DONE IT!...AGAIN
Y/N"
104 PRINTG15,"PUTTING LOAD MACHINE CODE INTO RAM":
105 REM ***** MACHINE CODE FOR LOAD *****
106 FORA=0TO82:READN:POKE-208+A,N:NEXT
107 DATA 245,217,42,125,255,237,91,127,255,237,75,129,255,197,1
108 DATA 8,0,237,74,1,128,0,197,125,214,48,254,10,56,2,214,7,245
109 DATA 35,126,214,48,254,10,56,2,214,7,193,229,33,0,0,213,17
110 DATA 16,0,25,16,253,141,209,18,19,225,35,193,11,11,120,177
111 DATA 32,210,193,11,120,177,32,195,241,217,201,0,0,0,0,0
112 REM ***** REVECTOR DISK BASIC COMMANDS *****
113 POKE16771,220:POKE16772,255: REM PUT
114 POKE16777,48:POKE16778,255: REM LOAD
115 POKE16801,134:POKE16802,255: REM SAVE
116 REM ***** LOAD LINES 33-34 TO RAM MEMORY 65414 *****
117 LK=231:LL=83: REM LINE 33 ADDRESS=21479(83 X 256 + 231)
118 LM=134:LN=255: REM SINK ADDRESS=65414(255 X 256 + 134)
119 LO=2: REM NUMBER OF REM LINES TO BE TRANSFERRED=2
120 GOSUB125
121 LOAD
122 GOTO142
123 REM ***** END OF INITIALISATION *****
124 REM ***** LOAD:SAVE:PUT PARAMETERS TO MEMORY *****
125 REM ***** LOAD HEX STRINGS IN LINES 1-34 TO RAM MEMORY ***
126 POKE-131,LL:POKE-130,LL:REM LK=LSB:LL=MSB 1ST REM LINE ADD
127 POKE-129,LM:POKE-128,LM:REM LM=LSB:LN=MSB DESTINATION ADD
128 POKE-127,LO:POKE-126,LO:REM LO=NUMBER REM LINES TO TRANSFER
129 RETURN
130 REM *** SAVE ROM/RAM MEMORY AS HEX STRINGS IN LINES 1-32 **
131 POKE-45,SK:POKE-44,SL:REM SK=LSB:SL=MSB 1ST MEMORY ADDRESS
132 POKE-43,SM:POKE-42,SN:REM SM=LSB:SN=MSB 1ST REM LINE ADDRES
133 POKE-41,SO:POKE-40,SO:REM SO=NUMBER OF REM LINES TO BE USED
134 RETURN
135 REM ***** PUT ROM/RAM MEMORY ELSEWHERE IN RAM MEMORY *****
136 POKE-18,HL:POKE-17,HM:REM HL=LSB:HM=MSB SOURCE ADDRESS
137 POKE-16,DE:POKE-15,DF:REM DE=LSB:DF=MSB DESTINATION ADDRESS
138 POKE-14,BC:POKE-13,BD:REM BC=LSB:BD=MSB MEMORY BLOCK SIZE
139 RETURN
140 REM ***** DELETE LINES 140 - 267 FOR NORMAL USE *****
141 REM ***** PUT COMMAND *****
142 CLS
143 PRINT"PUT COMMAND"
144 PRINT"MOVES MEMORY FROM ONE RAM LOCATION TO ANOTHER"
145 PRINT"DEMONSTRATION TO MOVE SCREEN TO 60000 AND BACK AGAIN"
146 PRINT$:INPUTX$
147 GOSUB250
148 REM ***** PUT SCREEN TO 60000 (EA60H) *****
149 HL=0:HM=60: REM SOURCE=15360 (60 X 256 + 0)
150 DE=96:DF=234: REM SINK=60000 (234 X 256 + 96)
151 BC=0:BD=4: REM MEMORY BLOCK=1024 (4 X 256 + 0)
152 GOSUB135
153 PUT
154 PRINT@896,"IT'S GONE TO 60000,NOW LET'S BRING IT BACK ";
155 PRINT@960,E$:INPUTX$

156 CLS
157 REM ***** PUT 60000 BACK ONTO THE SCREEN *****
158 HL=96:HM=234: REM SOURCE=60000 (234 X 256 + 96)
159 DE=0:DF=60: REM SINK=15360 (60 X 256 + 0)
160 BC=0:BD=4: REM MEMORY BLOCK=1024 BYTES (4 X 256 + 0)
161 GOSUB135
162 PUT
163 PRINT@896,AG$:
164 A$=INKEY$:IFA$="Y"THEN156ELSEIFA$() "N"THEN164
165 CLS
166 REM ***** SAVE COMMAND *****
167 PRINT"SAVE COMMAND"
168 PRINT"SAVES ROM/RAM MEMORY TO REM LINES AS HEXADECEMAL STRINGS"
169 PRINT"LET'S SAVE THE SCREEN TO REM LINES 1 - 16"
170 PRINT"PUT WILL BE USED TO RESTORE THE SCREEN FROM 60000"
171 PRINT$:INPUTX$
172 PUT: REM GET COPY OF SCREEN FROM 60000
173 REM ***** SAVE SCREEN TO LINES 1 - 16 *****
174 SK=0:SL=60: REM 1ST MEM ADD=15360 (60 X 256 + 0)
175 SM=239:SN=66: REM REM LINE 1 ADDRESS=17135 (66 X 256 + 239)
176 SO=16: REM 16 LINES TO TRANSFER
177 GOSUB130
178 SAVE
179 CLS
180 PRINT"DONE IT!..."
181 PRINT"HIT(BREAK) AND LIST LINES 1 - 16:SHOULD BE FILLED WITH HEX"
182 PRINT"TO RETURN TYPE (CONT)"
183 INPUT"HIT BREAK OR ENTER":X$
184 CLS
185 REM ***** SAVE SCREEN TO LINES 17 - 32 *****
186 PRINT"NOW LET'S DO THE SAME,BUT SAVE THE SCREEN TO LINES 17-32"
187 PRINT$:INPUTX$
188 PUT: REM GET COPY OF SCREEN FROM 60000
189 SK=0:SL=60
190 SM=111:SN=75: REM REM LINE 17 ADDRESS=19311(75 X 256 + 111)
191 SO=16
192 GOSUB130
193 SAVE
194 CLS
195 REM ***** LOAD COMMAND *****
196 PRINT"DONE IT!..."
197 PRINT"LOAD COMMAND"
198 PRINT"LOAD MOVES THE REM LINE STRINGS INTO MEMORY"
199 PRINT"LET'S GET THE SCREEN BACK FROM REM LINES 1 - 16"
200 PRINT$:INPUTX$
201 REM ***** LOAD LINES 1- 16 TO THE SCREEN *****
202 LK=231:LL=66: REM REM LINE ADDRESS=17127(66 X 256 + 231)
203 LM=0:LN=60: REM SCREEN=DESTINATION ADDRESS(60 X 256 + 0)
204 LO=16: REM 16 LINES TO MOVE
205 GOSUB125
206 LOAD
207 PRINT@896,CHR$(15):
208 INPUT"DONE IT!...NOW LET'S GET LINES 17 - 32 (ENTER)":X$
209 CLS
210 REM ***** LOAD LINES 17 - 32 TO THE SCREEN *****
211 LK=103:LL=75: REM REM LINE 17 ADDRESS=19303(75 X 256 + 103)
212 LM=0:LN=60
213 LO=16
214 GOSUB125
215 LOAD
216 PRINT@896,"DONE IT!...":E$=:INPUTX$
217 CLS
218 REM ***** PARTIAL SCREEN RETRIEVAL *****
219 PRINT"NOW LET'S TRY A PARTIAL SCREEN RETRIEVAL"
220 INPUT"STATE FIRST REM LINE (1-16 ONLY)":FL
221 IFFL(10RFL)16THEN220
222 INPUT"STATE LAST REM LINE (1- 16 ONLY)":EL
223 IFEL(10REL)16OREL(FLTHEN222
224 LO=(EL-FL)+1
225 LJ=17127+(FL-1)*136)
226 LL=INT(LJ/256):LK=LJ-(LL*256)
227 LI=15360+((FL-1)*64)
228 LN=INT(LI/256):LM=LI-(LN*256)
229 GOSUB125

```



```

230 CLS
231 LOAD
232 PRINT@896,AG$;
233 A$=INKEY$;IFA$="Y"THEN235
234 IFA$="N"THEN236ELSE233
235 CLS:GOTO220
236 REM ***** ONE FINAL DEMONSTRATION *****
237 CLS
238 PRINT"FINALLY, HOW'S THIS?"

239 PRINT"PUT ROM 0 - 1023 TO SCREEN"
240 PRINT"SAVE SCREEN TO REM LINES 1 - 16"
241 PRINT"LOAD REM LINES BACK TO SCREEN"
242 PRINT$;:INPUTX$
243 HL=0:HM=0:DE=0:DF=60:BC=0:BD=4:GOSUB135:PUT
244 SK=0:SL=60:SM=239:SN=66:SO=16:SP=0:GOSUB130:SAVE
245 CLS
246 LK=231:LL=66:LM=0:LN=60:LO=16:LP=0:GOSUB125:LOAD
247 PRINT@960,CHR$(31);
248 PRINT@960,"PHEW, DONE IT!!NOTE MEM SIZE LINE 5,BYE.....(BREAK)";

```

```

249 GOTO249
250 REM ***** GRAPHICS GENERATOR SUBROUTINE *****
251 REM GENERATE A SCREENFUL FOR DEMONSTRATION PURPOSES
252 CLS
253 A=32
254 FOR B=1TO14
255 C=AND(191):IFC(32)THEN255
256 D=AND(70)
257 E=15360+A
258 FOR F=1TO8
259 POKEE+F,C:POKEE-F,C
260 NEXT F
261 A=A+64
262 NEXT B
263 RETURN
264 REM ***** END *****
265 REM ** (C) T.A. ITHILL 1984 **
266 REM ** TRS80 MODEL I/III 16K - 48K **
267 REM ** HEXADEcimal STRING STORAGE **
268 REM *****

```

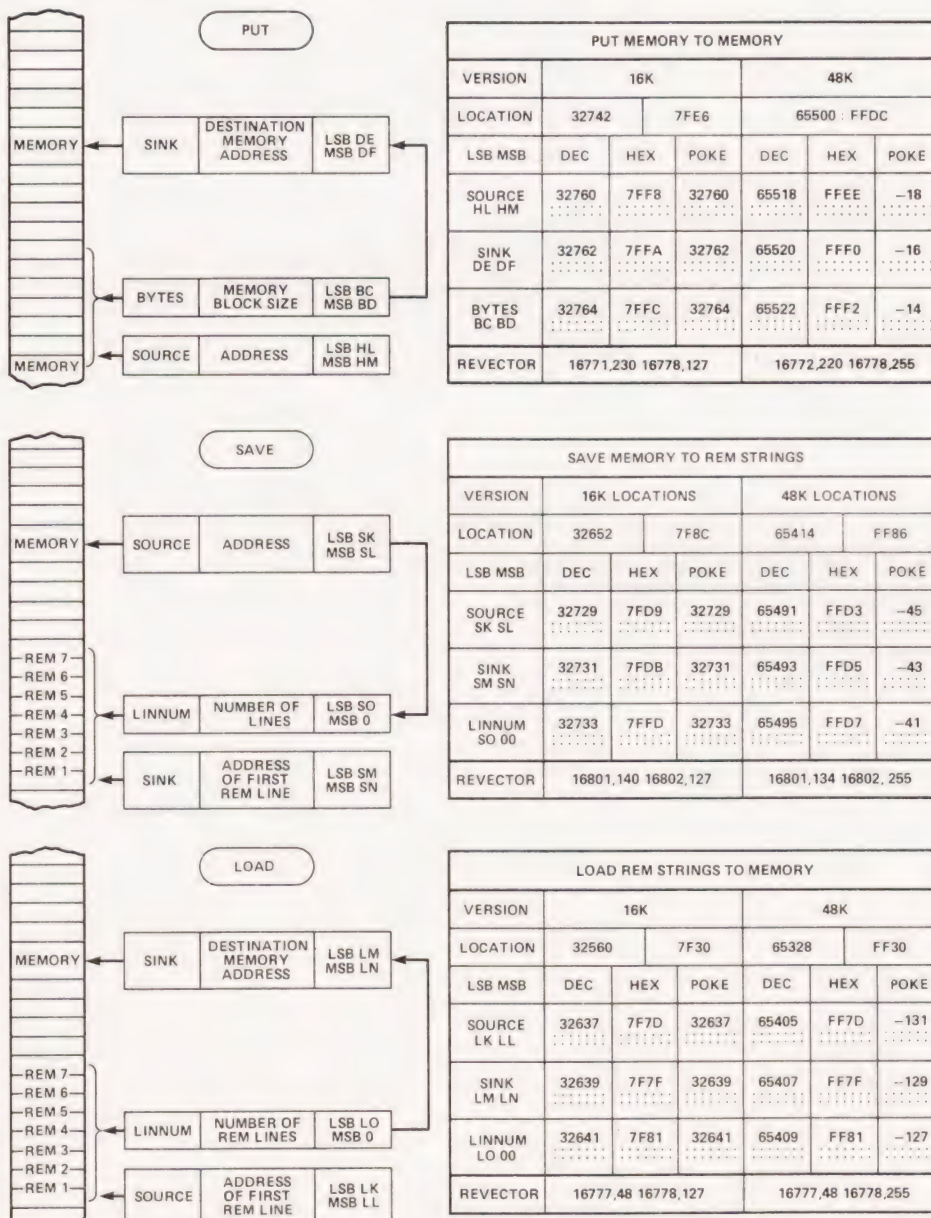


Fig. 2 Parameters of PUT, SAVE and LOAD.

fectly adequate for small amounts of machine code and for passing data into RAM, it becomes rather slow when large chunks are involved. In addition, if memory is to be copied into DATA program lines from RAM as decimals, three or four bytes are needed to store one memory byte — two bytes for numbers between 10 and 99, three for numbers between 100 and 255, plus the comma separator. Other methods such as dummy strings suffer the disadvantages of very untidy listing and the inability to edit the resulting

When these limitations in mind I explored the possibility of hexadecimal string storage of memory data. Using this method, any number between 0 and 255 can be represented by two bytes and commas are not needed. Lines 100 and 101 contain an example of this type of storage. In fact this is the machine code for the routines accessed by SAVE and PUT. Lines 116 — 121 use the LOAD command (initialised in line 114) to LOAD the hexadecimal data in lines 100 and 101 into high memory (65414). The obvious overhead required with the technique is the extra machine code needed to pack and unpack hex strings. However, the speed of execution more than compensates for this. Comments in the Assembler Listings 2 and 3 explain how the hexadecimal conversions and string storage are achieved.

Three other points are worth noting at this stage.


```

00100 ;LISTING 2      LOAD ROUTINE
00110 ;
00120 ;*****
00130 ;* SENDS HEXADECIMAL STRINGS IN REM LINES TO MEMORY *
00140 ;* 2 HEXADECIMAL STRING BYTES = 1 DECIMAL MEMORY BYTE *
00150 ;* WORKING: AFH = 16 * 10 + 15 = 160 + 15 =175 DEC *
00160 ;* (SOURCE) = ADDRESS OF FIRST REM LINE *
00170 ;* (SINK) = THE DESTINATION MEMORY ADDRESS *
00180 ;* (LINNUM) = NUMBER OF REM LINES TO BE TRANSFERRED *
00190 ;* (C) T.A. ITHILL 1984 *
00200 ;*****
00210 ;
FF30 00220      ORG      0FF30H ;65328 FOR 48K SYSTEMS
00230 ;
0080 00240 STRLEN EQU      80H
FF30 F5 00250 START  PUSH  AF          ;SAVE AF
FF31 D9 00260      EXX          ;SAVE BC,DE,HL
FF32 2A70FF 00270      LD      HL,(SOURCE) ;SOURCE MEMORY ADDRESS(FIRST REM LINE ADDRESS) TO HL
FF35 ED5B7FFF 00280      LD      DE,(SINK) ;DESTINATION MEMORY ADDRESS
FF39 ED4B81FF 00290      LD      BC,(LINNUM) ;NUMBER OF REM LINES TO TRANSFER TO MEMORY
FF3D C5 00300 NXTLIN  PUSH  BC          ;SAVE A COPY FOR LATER
FF3E 010000 00310      LD      BC,B      ;NUMBER OF BASIC LINE HOUSEKEEPING BYTES TO SKIP:LINK ADDRESSES,LINE NUMBERS
FF41 ED4A 00320      ADC      HL,BC     ;ADD THEM TO SOURCE MEMORY COUNT IN HL
FF43 010000 00330      LD      BC,STRLEN ;BYTES PER REM LINE
FF46 C5 00340 LINLEN  PUSH  BC          ;SAVE A COPY FOR LATER
FF47 7E 00350 NXTBYT  LD      A,(HL)    ;CONTENTS OF MEM ADDRESS TO REG A:BYTE 1/2 OF 2 BYTE HEXADECIMAL
FF48 D630 00360      SUB      30H      ;ASCII OF BYTE IN A - 48
FF4A FE0A 00370      CP      0AH      ;(10 BYTE=0-9)>10 BYTE=A-F
FF4C 3802 00380      JR      C,NOSUB   ;BYTE (10 SO LEAVE IT
FF4E D607 00390      SUB      7H      ;BYTE )10 SO SUB 7 TO GET VALUE
FF50 F5 00400 NOSUB   PUSH  AF          ;SAVE BYTE 1/2:THE MULTIPLIER
FF51 23 00410      INC      HL        ;MOVE SOURCE MEMORY COUNT ON ONE
FF52 7E 00420      LD      A,(HL)    ;CONTENTS OF MEM ADDRESS TO REG A:BYTE 2/2 OF 2 BYTE HEXADECIMAL
FF53 D630 00430      SUB      30H      ;ASCII OF BYTE IN A - 48
FF55 FE0A 00440      CP      0AH      ;(10 BYTE=0-9)>10 BYTE=A-F
FF57 3802 00450      JR      C,NOSUB   ;BYTE(10 SO LEAVE IT
FF59 D607 00460      SUB      7H      ;BYTE)10 SO SUB 7 TO GET VALUE
FF5B C1 00470 NOSUB   POP      BC      ;GET MULTIPLIER OFF STACK
FF5C E5 00480      HL        ;SAVE MEMORY COUNT WE NEED REG L OF HL FOR SUMS
FF5D 210000 00490      LD      HL,0     ;ZERO HL
FF60 D5 00500      DE        ;SAVE SINK ADDRESS WE NEED DE FOR SUMS AS WELL
FF61 110000 00510      LD      DE,10H   ;DE=16 HEXADECIMAL CONSTANT
FF64 19 00520 AGAIN  ADD      HL,DE     ;MULTIPLY BY ADDITION:16*MULTIPLIER IN BC
FF65 10FD 00530      DJNZ     AGAIN     ;CONTINUE UNTIL DONE
FF67 8D 00540      ADC      A,L        ;ADD CONTENTS OF L TO BYTE 2/2 IN REG A
FF68 D1 00550      POP      DE        ;GET SINK ADDRESS FROM STACK
FF69 12 00560      LD      (DE),A     ;PUT DECIMAL VALUE INTO MEMORY SINK
FF6A 13 00570      INC      DE        ;MOVE SINK MEMORY ADDRESS ON ONE
FF6B E1 00580      POP      HL        ;GET SOURCE MEMORY ADDRESS FROM STACK
FF6C 23 00590      INC      HL        ;MOVE SOURCE MEMORY ADDRESS ON ONE
FF6D C1 00600      POP      BC        ;GET BYTES PER LINE COUNT
FF6E 0B 00610      DEC      BC        ;DECREASE BY THE 2 BYTES WE'VE JUST PROCESSED
FF6F 0B 00620      DEC      BC
FF70 78 00630      LD      A,B        ;CHECK LINE HASN'T ENDED
FF71 B1 00640      OR      C          ;IF B=C THEN ZERO FLAGGED
FF72 20D2 00650      JR      NZ,LINLEN ;BC)0 SO OFF TO PROCESS NEXT 2 BYTES IN THE LINE
FF74 C1 00660      POP      BC        ;END OF LINE SO GET LINE COUNTER FROM STACK
FF75 0B 00670      DEC      BC        ;TAKE ONE OFF FOR THE LINE WE'VE JUST DONE
FF76 78 00680      LD      A,B        ;CHECK LINE COUNT HASN'T REACHED ZERO
FF77 B1 00690      OR      C          ;IF B=C THEN ZERO FLAGGED
FF78 20C3 00700      JR      NZ,NXTLIN ;BC)0 SO OFF TO PROCESS NEXT LINE
FF7A F1 00710      POP      AF        ;RESTORE AF
FF7B D9 00720      EXX          ;RESTORE BC,DE,HL
FF7C C9 00730      RET          ;BC=0 SO WE'VE DONE ALL THE LINES:BACK TO BASIC
FF7D 0000 00740 SOURCE  DEFW      0     ;POKE ADDRESS OF FIRST REM LINE TO BE USED HERE
FF7F 0000 00750 SINK    DEFW      0     ;POKE DESTINATION ADDRESS FOR REM LINES DATA HERE
FF81 0000 00760 LINNUM  DEFW      0     ;POKE NUMBER OF REM LINES TO BE TRANSFERRED HERE
FF80 0000 00765      END      START
00800 TOTAL ERRORS
AGAIN FF64
LINLEN FF46
LINNUM FF81
NOSUB FF5B
NOSUB FF50
NXTBYT FF47
NXTLIN FF3D
SINK FF7F
SOURCE FF7D
START FF30
STRLEN 0080

```

Listing 2. Assembler listing for the LOAD routine.


```

00100 ;LISTING 3      SAVE ROUTINE
00110 ;
00120 ;*****
00130 ;* SENDS MEMORY TO REM LINES AS HEXADECIMAL STRINGS *
00140 ;* 1 DECIMAL MEMORY BYTE = 2 HEXADECIMAL STRING BYTES *
00150 ;* PROCESSES MS NIBBLE OF MEMORY BYTE FIRST *
00160 ;* PROCESSES LS NIBBLE OF MEMORY BYTE NEXT *
00170 ;* (SOURCE) = ADDRESS OF FIRST MEMORY LOCATION *
00180 ;* (SINK) = ADDRESS OF 1ST REM LINE TO BE FILLED *
00190 ;* (LINNUM) = NUMBER OF REM LINES TO BE FILLED *
00200 ;* (C) T.A.ITHELL 1984 *
00210 ;*****
00220 ;
FF86 00230      ORG      0FF86H      ;65414 FOR 48K SYSTEMS
00240 ;
0080 00250 STRLEN EQU 80H
FF86 F5 00260 START PUSH AF      ;SAVE AF
FF87 D9 00270      EXX      ;SAVE BC,DE,HL
FF88 2AD3FF 00280 LD HL,(SOURCE) ;ADDRESS OF FIRST MEMORY LOCATION TO BE COPIED TO STRINGS
FF8B ED5BD5FF 00290 LD DE,(SINK) ;FIRST REM LINE ADDRESS TO BE FILLED
FF8F 018000 00300 LD BC,STRLEN ;BYTES PER REM LINE
FF92 DD2AD7FF 00310 LD IX,(LINNUM) ;NUMBER OF REM LINES
FF96 7E 00320 NXTBYT LD A,(HL) ;CONTENTS OF MEMORY ADDRESS TO REG A
FF97 F5 00330      PUSH AF      ;SAVE A COPY FOR LATER
FF98 0F 00340      RRCA      ;SHIFT MS NIBBLE
FF99 0F 00350      RRCA      ;TO LS NIBBLE FOR CONVERSION
FF9A 0F 00360      RRCA      ;NEEDS FOUR ROTATES
FF9B 0F 00370      RRCA      ;DONE IT!
FF9C CDC2FF 00380 CALL DECEX ;DEC TO HEXDEC SUBROUTINE
FF9F F1 00390      POP AF      ;GET COPY FOR LS NIBBLE
FFA0 CDC2FF 00400 CALL DECEX ;PROCESS LS NIBBLE
FFA3 23 00410      INC HL      ;MOVE TO NEXT MEMORY ADDR
FFA4 CDBFFF 00420 CALL ZERO ;REACHED END OF REM LINE?
FFA7 2802 00430      JR Z,NXTLIN ;YES-GO TO NEXT REM LINE
FFA9 18EB 00440      JR NXTBYT ;NO-SO OFF FOR NEXT MEMORY BYTE
FFAB DD2B 00450 NXTLIN DEC IX ;DECREMENT REM LINE COUNT
FFAD DDES 00460      PUSH IX ;TRANSFER COUNT TO BC FOR
FFAF C1 00470      POP BC ;LINE COUNT ZERO CHECK
FFB0 CDBFFF 00480 CALL ZERO ;FILLED LAST REM LINE?
FFB3 281B 00490      JR Z,BACK ;YES SO BACK TO BASIC
FFB5 0608 00500      LD B,B ;NO SO SKIP NEXT 8 BYTES
FFB7 13 00510 AGAIN INC DE ;IN REM LINES SECTION OF
FFB8 10FD 00520      DJNZ AGAIN ;BASIC PROG(LINK ADDRESSES,LINE NUMBERS ETC)
FFBA 018000 00530      LD BC,STRLEN ;RESET BYTES/REM LINE COUNT
FFBD 18D7 00540      JR NXTBYT ;BACK TO PROCESS NEXT REM LINE OF 128 BYTES
FFBF 78 00550 ZERO LD A,B ;CHECK IF BC=0
FFC0 B1 00560      OR C ;IF B=C THEN ZERO FLAGGED
FFC1 C9 00570      RET ;BACK TO NEXT INSTRUCTION
FFC2 E60F 00580 DECEX AND 0FH ;ZAP BITS 4-7 OF REG A
FFC4 C630 00590      ADD A,30H ;MAKE BITS 0-3 INTO ASCII
FFC6 FE3A 00600      CP 3AH ;57=ASCII 9
FFC8 3802 00610      JR C,LEAVIT ;A<58 SO LEAVE IT ALONE
FFCA C507 00620      ADD A,7H ;A>57 SO ADD 7 TO GET ASCII A - F
FFCC 12 00630 LEAVIT LD (DE),A ;A INTO REM LINE ADDRESS
FFCD 13 00640      INC DE ;NEXT ADDRESS IN REM LINE
FFCE 0B 00650      DEC BC ;DECREMENT REM LINE BYTES
FFCF C9 00660      RET ;BACK TO NEXT INSTRUCTION
FFD0 F1 00670 BACK POP AF ;RESTORE AF
FFD1 D9 00680      EXX ;RESTORE BC,DE,HL
FFD2 C9 00690      RET ;BACK TO BASIC
FFD3 0000 00700 SOURCE DEFW 0 ;POKE FIRST MEMORY ADDRESS HERE
FFD5 0000 00710 SINK DEFW 0 ;POKE STARTING ADDRESS OF REM LINES HERE
FFD7 0000 00720 LINNUM DEFW 0 ;POKE NUMBER OF REM LINES HERE
FF86 00730      END      START
00000 TOTAL ERRORS
AGAIN FF87
BACK FFD0
DECEX FFC2
LEAVIT FFCC
LINNUM FFD7
NXTBYT FF96
NXTLIN FFA8
SINK FFD5
SOURCE FFD3
START FF86
STRLEN 0080
ZERO FFBF

```

Listing 3. Assembler listing for the SAVE routine.

SAVE MEMORY TO REM LINES

| REM LINE NUMBER (SO) | ADDRESS (SINK) | LSB (SM) | MSB (SN) |
|-------------------------|-------------------|-------------|-------------|
| 1 | 17135 | 239 | 66 |
| 2 | 17271 | 119 | 67 |
| 3 | 17407 | 255 | 67 |
| 4 | 17543 | 135 | 68 |
| 5 | 17679 | 15 | 69 |
| 6 | 17815 | 151 | 69 |
| 7 | 17951 | 31 | 70 |
| 8 | 18087 | 157 | 70 |
| 9 | 18223 | 47 | 71 |
| 10 | 18359 | 183 | 71 |
| 11 | 18495 | 63 | 72 |
| 12 | 18631 | 199 | 72 |
| 13 | 18767 | 79 | 73 |
| 14 | 18903 | 215 | 73 |
| 15 | 19039 | 95 | 74 |
| 16 | 19175 | 231 | 74 |
| 17 | 19311 | 111 | 75 |
| 18 | 19447 | 247 | 75 |
| 19 | 19583 | 127 | 75 |
| 20 | 19719 | 7 | 77 |
| 21 | 19855 | 143 | 77 |
| 22 | 19991 | 23 | 78 |
| 23 | 20127 | 159 | 78 |
| 24 | 20263 | 39 | 79 |
| 25 | 20399 | 175 | 79 |
| 26 | 20535 | 55 | 80 |
| 27 | 20671 | 191 | 80 |
| 28 | 20807 | 71 | 81 |
| 29 | 20943 | 207 | 81 |
| 30 | 21079 | 87 | 82 |
| 31 | 21215 | 223 | 82 |
| 32 | 21351 | 103 | 83 |
| 100 | 21487 | 239 | 83 |
| 101 | 21623 | 119 | 84 |

LOAD REM LINES TO MEMORY

| REM LINE NUMBER (LO) | ADDRESS (SOURCE) | LSB (LK) | MSB (LL) |
|-------------------------|---------------------|-------------|-------------|
| 1 | 17127 | 231 | 66 |
| 2 | 17263 | 111 | 67 |
| 3 | 17399 | 247 | 67 |
| 4 | 17535 | 127 | 68 |
| 5 | 17671 | 7 | 69 |
| 6 | 17807 | 143 | 69 |
| 7 | 17943 | 23 | 70 |
| 8 | 18079 | 159 | 70 |
| 9 | 18215 | 39 | 71 |
| 10 | 18351 | 175 | 71 |
| 11 | 18487 | 55 | 72 |
| 12 | 18623 | 191 | 72 |
| 13 | 18759 | 71 | 73 |
| 14 | 18895 | 207 | 73 |
| 15 | 19031 | 87 | 74 |
| 16 | 19167 | 223 | 74 |
| 17 | 19303 | 103 | 75 |
| 18 | 19439 | 239 | 75 |
| 19 | 19575 | 119 | 76 |
| 20 | 19711 | 255 | 76 |
| 21 | 19847 | 135 | 77 |
| 22 | 19983 | 15 | 78 |
| 23 | 20119 | 151 | 78 |
| 24 | 20255 | 31 | 79 |
| 25 | 20391 | 167 | 79 |
| 26 | 20527 | 47 | 80 |
| 27 | 20663 | 183 | 80 |
| 28 | 20799 | 63 | 81 |
| 29 | 20935 | 199 | 81 |
| 30 | 21071 | 79 | 82 |
| 31 | 21207 | 215 | 82 |
| 32 | 21343 | 95 | 83 |
| 100 | 21479 | 231 | 83 |
| 101 | 21615 | 111 | 84 |

Fig. 4 Starting addresses for REM lines 1-32.

of REM line hexadecimal string specified by LO (= LIN-
NUM) from the first REM line
whose address is specified by
LK and LL (= SOURCE) to
memory starting at the address
specified by LM and LN
(= SINK). Listing 1 has
examples in lines 116 — 121
and 195-235, Listing 2 has the
assembler code for LOAD.

As with SAVE, the para-
meters are first obtained from
the SOURCE, SINK and LIN-
NUM buffers. The routine then
gets the first two hexadecimal
bytes from the designated
REM line and converts them
back into decimal form. This
value is then loaded into
memory and the process
repeated until all the REM lines
requested have been conver-
ted and their contents trans-
ferred. Once again account is
taken of the housekeeping
bytes in the REM lines by add-
ing eight after every 128
bytes.

● PUT copies the number of

bytes specified by BC and BD
(= BYTES) from the starting
address in memory specified
by HL and HM (= SOURCE) to
the destination address in
memory specified by DE and
DF (= SINK). Listing 1 has
examples in lines 141 — 165,
Listing 4 has the assembler
code for PUT.

PUT exploits the block
transfer instruction LDIR: all the
user has to do is to pass the
three parameters into the
SOURCE, SINK and BYTES
buffers. PUT will then effect the
block memory move.

Once initialised and with
suitable parameters defined in
their buffers, LOAD and PUT
will also work from command
mode. As each REM line
requires 128 bytes to store 64
memory bytes you must
obviously allow for this when
allocating numbers to SO.
Here are two examples:

● Saving the first eight screen
lines
1 Screen line = 64 memory

bytes
1 REM line holds 64 memory
bytes
Therefore SO = 8

● Saving 64000 to 65535
Number of bytes = 65535 —
64000 + 1 = 1536 memory
bytes
REM lines needed = SO =
1536/64 = 24

If SO is greater than 32 then
you can add more REM lines
after line 32. However, adding
more will alter the positions of
lines 100 and 101 in memory.
As they contain the SAVE and
PUT machine code, you must
change the values of LK and
LL in line 117 to point to the
new positions. Each extra REM
line added pushes line 100
another 136 bytes further down
in memory. See Fig. 4 for
memory locations of the
various REM lines.

Editing Lines Unlike some
other methods of data storage,
the hexadecimal strings can
be edited and listed like nor-
mal lines. You must, of course,

make sure that the REM lines
always have 128 bytes bet-
ween the quotes.

EASY ENTERING

The idea of having a program
that alters itself during execu-
tion is very alien to the purists.
Nevertheless the technique
can be very useful, but it is not
a method for the faint-hearted.
One mistake in entering the
REM lines and the first time
SAVE is executed the inter-
preter will streak off to infinity at
the speed of light, taking your
evening's work with it. Moral —
CSAVE before you try any of
the commands. Type each
REM line as follows:

Line number (1 space) REM"
type F 128 times" (ENTER)

There is nothing important
about F, any valid hex-
adecimal number 0 — F will
do. It is just a way of ensuring
that the correct amount of
space is left between the
quotes.


```

00100 ;LISTING 4      PUT ROUTINE
00110 ;
00120 ;*****
00130 ;* GENERAL PURPOSE MEMORY BLOCK MOVE ROUTINE *
00140 ;* (SOURCE) = START OF MEMORY BLOCK TO BE MOVED *
00150 ;* (SINK) = DESTINATION OF MEMORY BLOCK *
00160 ;* (BYTES) = LENGTH OF MEMORY BLOCK IN BYTES *
00170 ;*****
00180 ;
FFDC 00190          ORG 0FFDCH          ;65500 FOR 48K SYSTEMS
00200 ;
FFDC F5 00210 START PUSH AF          ;SAVE AF
FFDD D9 00220 EXX          ;SAVE BC,DE,HL
FFDE 2AEFF 00230 LD HL,(SOURCE)      ;GET MEMORY BLOCK STARTING ADDRESS
FFE1 ED5BFFF 00240 LD DE,(SINK)      ;GET DESTINATION ADDRESS FOR THE BLOCK
FFES ED4BF2FF 00250 LD BC,(BYTES)    ;GET LENGTH OF BLOCK TO BE MOVED
FFEB F1 00260 LDIR          ;MOVE THE BLOCK
FFEC D9 00270 POP AF          ;RESTORE AF
FFED C9 00280 EXX          ;RESTORE BC,DE,HL
FFEE 0000 00290 RET          ;BACK TO BASIC
FFF0 0000 00300 SOURCE DEFW 0        ;POKE STARTING ADDRESS HERE
FFF2 0000 00310 SINK DEFW 0         ;POKE DESTINATION ADDRESS HERE
FFDC 0000 00320 BYTES DEFW 0        ;POKE LENGTH OF BLOCK HERE
00000 TOTAL ERRORS
BYTES FFF2
SINK FFF0
SOURCE FFEE
START FFDC
00330 END START

```

Listing 4. Assembler listing for the PUT routine.

If you examine Fig. 1 showing the way in which REM line 1 and part of 2 are stored, it should be clear why a wrongly typed program will crash. Link addresses, line numbers and end of line markers will be changed irreparably. The task of entering the REM lines is made considerably easier by using the Screen Editor published recently in *Computing Today*, (January 1984).

Because lines 100 and 101 contain the SAVE and PUT machine code they must be copied *exactly*.

An important point to remember is that all REM lines must be the first lines in the program. Nothing can be put before them. SAVE and LOAD assume this is the case.

Before entering the program, set the memory size to 59999 (48K) or 29999 (16K).

This will protect both the machine code for SAVE, LOAD and PUT and the space needed to dump the contents of the screen for demonstration purposes. In normal use, protect memory for the machine code and any extra for screen or string dumps.

USING THE PROGRAM

All the code from line 140 onwards can be deleted once you have seen how the various parts of the program work.

To use each command, pass values for the various parameters into the appropriate subroutine between lines 124 and 139, then execute the command as a program statement or from command mode. The buffers will retain the parameter values until altered. The examples from line 140 onwards make it clear how to set up the parameters. Most of the parameter values represent the least and most significant bytes of the relevant addresses. The way to calculate the LSB and MSB for any address is as follows:

$$\begin{aligned}\text{MSB} &= \text{INT}(\text{Address}/256) \\ \text{LSB} &= \text{Address} - (\text{MSB} * 256)\end{aligned}$$

Lines 226 and 228 contain examples of the procedure. Figure 5 provides a summary of

the names of the LSB and MSB for each command.

One feature lacking on the TRS80 is the ability to load hexadecimal values into RAM. The use of hexadecimal strings overcomes this irritation. Strings of assembler hexadecimal can be created and then placed into memory directly without having to convert them into decimals first. This should be of considerable help to those without a monitor. Using SAVE it is, of course, also possible to dump machine code programs back into the REM lines, allowing back-ups of some types of system tapes to be made.

Finally at the end, in lines 236 — 249 is a small demonstration of all the commands working together. Figure 6 shows what happens.

I use this program for saving single screens of information created by another large drawing program called Sketchpad, appended after line 140. The information on the screen can be transferred to or retrieved from memory at will using PUT. For a permanent record I use SAVE to transfer the screen to strings, then CSAVE the program. When CLOADED again, executing LOAD transfers the strings into memory to be called back by PUT. Allied to a screen-dump routine standard forms, diagrams, games boards and so on can be printed out again and again.

| COMMAND | LABEL | VARIABLE NAME | |
|---------|--------|---------------|-----|
| | | LSB | MSB |
| PUT | SOURCE | HL | HM |
| | SINK | DE | DF |
| | BYTES | BC | BD |
| SAVE | SOURCE | SK | SL |
| | SINK | SM | SN |
| | LINNUM | SO | 0 |
| LOAD | SOURCE | LK | LL |
| | SINK | LM | LN |
| | LINNUM | LO | 0 |

Fig. 5 Names of LSB and MSB for each command.

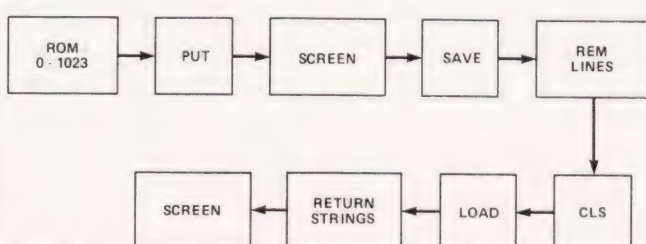


Fig. 6 Flow diagram to show sequence of commands.



Portable micros have been with us now for a number of years. Starting at the small end was the Sharp PC-1211 and Casio FX-702P, while up at the top end of the range, the Osborne 1 set the ball rolling. Over the last few years the top end machines have got considerably smaller, and there has been a gradual move towards battery from mains operation. And, during the same period, the speed, power and facilities offered by the small hand-held machine have been on the up and up. At the point where the two trends now meet sits the Epson PX-8.

THE HARDWARE

The PX-8 is contained in a compact, A4 size ivory-coloured plastic casing just under two inches deep. A light-grey plastic cover conceals and protects the keyboard, and a large liquid crystal display panel is hinged down flat over a single micro-cassette drive. The unit has two small hinged feet underneath, which can be used to raise the rear end of the machine, so that the keyboard is tilted to the usual typing

angle. A carrying handle is also thoughtfully provided.

Removing the protective cover reveals a full-size dark grey standard QWERTY keyboard. In addition to this, several other keys are provided, including four cursor control keys and nine extra function keys, of which five are user definable, with two functions each. Above and to the right of the keyboard is the mechanical switch to unlock

the display from its closed position. With the display unlocked, it is free to hinge through 180 degrees in 12 click steps, so that it can be set for the best viewing angle in any given situation.

Moving the display to its working position also uncovers the micro-cassette drive. The tape supplied in the review model was of type MC-30, (15 minutes per side) capable of holding up to 50K of data and

programs on each side. Extra tapes, in 30 or 60 minute lengths are best obtained from Epson as they are not the same as the standard dictation machine cassettes.

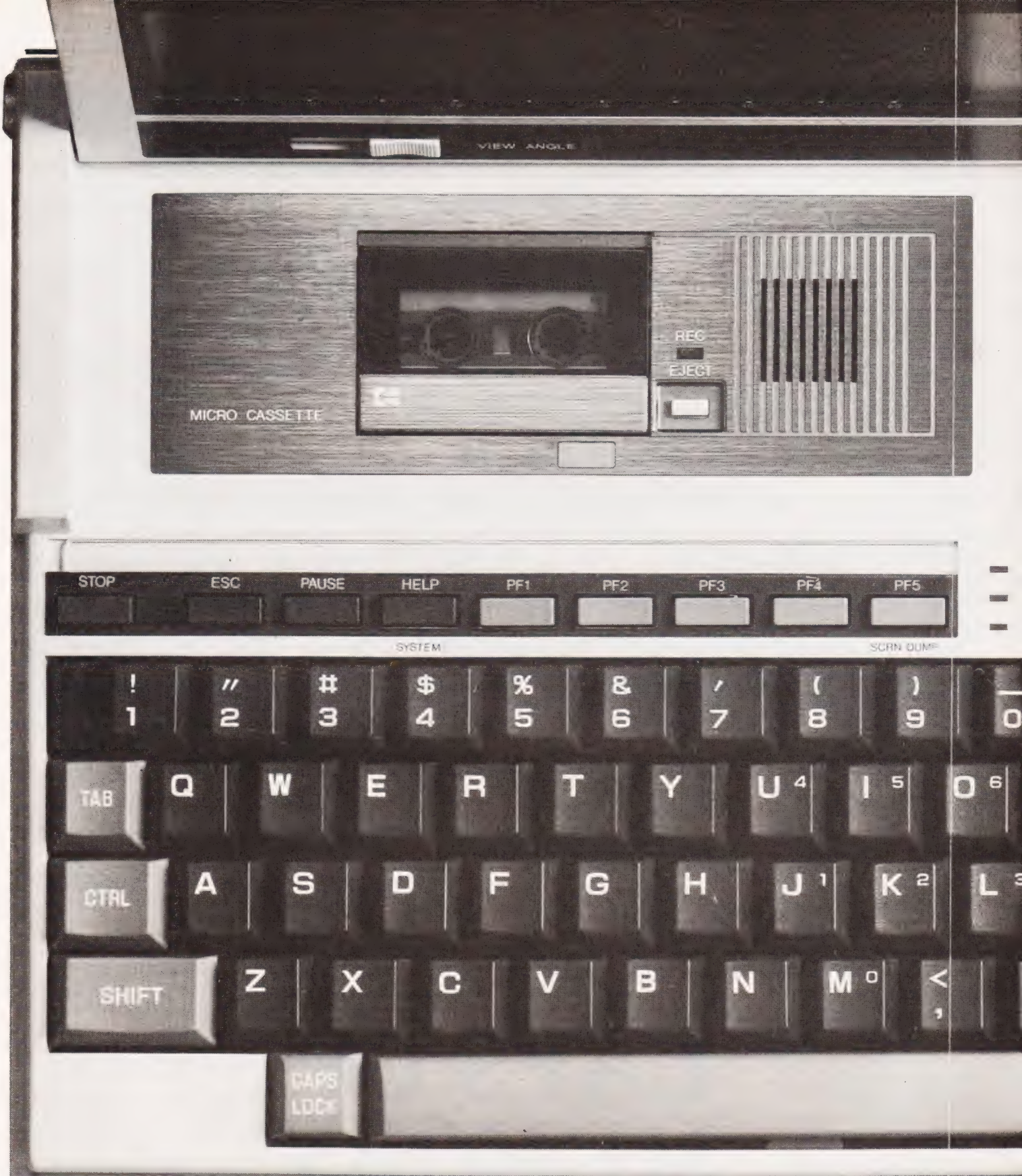
The loudspeaker for sound output is also mounted under the display to the right of the micro-cassette drive. The sound level can be varied by a volume control on the right-hand side of the machine. Just behind the volume control is the main on/off power switch. For its portable power requirements, the unit contains two re-chargeable battery packs. One of these packs is used to power the machine while it is switched on and should last for 16 hours of continuous use.

The second battery pack is very small and is only used to 'battery back' the unit's memory between charging sessions. The mains power transformer supplied with the machine plugs into a socket on the rear panel and the power supply provides the power for normal office use of the machine and for charging the internal batteries. One final item of standard hardware worthy of a mention is the real time internal clock which, as we shall see, is put

LAPS OF MEMORY

Phil Cornes

Manufacturers keep on trying to pack more punch into their portables, and now Epson have produced the PX-8, a lap-sized computer with a lot to offer.



to good use by the software.

EXTRAS

In addition to the hardware so far described, Epson intend to make several extra PX-8 compatible hardware items available in the near future. These items are either under development for release shortly, or drawn from Epson's current range. Several inter-

face sockets are provided on the rear of the PX-8 to cope with this future expansion capability.

Looking at the machine from the rear, the socket on the left is marked SP OUT which is an external loud-speaker jack for listening to music generated by the software. (Music can be generated from BASIC using the BEEP and SOUND commands

or from machine code using the operating system sound routine.) Next to this is a second jack socket labelled A/D IN which is actually an analogue to digital converter input. This input can be used to allow the PX-8 to directly monitor external events and voltages in the range 0 to 2 volts. The third jack socket is labelled BRCD and a bar code light pen can plug into

this enabling the machine to be used in stock-taking-type applications.

The next interface, an edge connector onto the PX-8's main PCB, is covered by a plastic moulding. This connector is used when you attach the expansion RAM Disk unit which is housed in a matching ivory-coloured, wedge-shaped plastic case which screws in place under-



neath the main unit, giving the keyboard the same angle as the two small hinged feet. The memory box adds an extra 120K of RAM to the existing 64K, making 184K in all. The extra RAM is automatically configured by the system to operate as a RAM disk unit. This means that the PX-8 treats this block of memory as though it were the contents of an ordinary disk drive, con-

taining a disk directory and files that can be accessed many times faster than an ordinary disk.

There are two more interface sockets on the back of the machine which are both serial ports. The first is a standard RS232C port connecting leads are available to attach the PX-8 to any of the standard RS232C devices such as a printer or modem.

This photograph of the Epson PX-8 portable is reproduced life-size, so you can try fitting your fingers on the keyboard! The contrast of the LCD display can be adjusted for optimum viewing using the slide switch below the screen. The built-in micro-cassette drive is located beneath the flip-up screen. Various system functions are flagged by small LEDs, and the overall styling is extremely neat and elegant: the various special areas of the keyboard are tastefully colour-coded (see over).

The second serial socket is used to connect real disk drives to the machine. These can be of several types including a new 3½", 360K battery powered disk system, manufactured by Epson themselves.

ALL INCLUSIVE

All the hardware that we have looked at so far provides the perfect environment in which to run the software that is supplied bundled with the machine. This begins with CP/M version 2.2 — the world's most successful 8-bit micro computer operating system. The version that runs on the PX-8 has been modified by Epson to give it one or two extra facilities. You will probably know that CP/M is able to control up to 16 disk drives labelled A to P: of these, drives A to H are available as standard on the PX-8. Drive A uses some of the internal 64K of RAM as a small RAM disk or the external 120K RAM disk pack if it is fitted.

The contents of logical drives B and C are physically contained in exchangeable ROMs that are plugged into two special ROM sockets behind an easily removable cover on the underside of the unit. All of the standard application and utility software supplied with the machine is contained in a set of these plug-in ROM modules. Disk drives D to G would be real external disk drives if fitted, and finally drive H is the built-in micro-cassette deck.

The plug-in ROM modules supplied contain all of the usual and necessary software. These include Microsoft MBASIC interpreter, MicroPro Wordstar word processing package and Calc spread sheet, and a useful software

TABLE 1

| Benchmark | Time |
|-----------|------|
| 1 | 2.9 |
| 2 | 7.7 |
| 3 | 18.6 |
| 4 | 18.5 |
| 5 | 20.7 |
| 6 | 39.2 |
| 7 | 61.3 |
| 8 | 87.9 |
| Average | 32.1 |

Times in seconds to run eight standard benchmark tests in MBASIC.

appointments book and alarm system also by MicroPro called, imaginatively, Portable Scheduler. A fourth module contains most of the standard CP/M utilities like PIP, STAT, SUBMIT and CONFIG. The latter is included to allow such operations as setting up the user-defined keys, setting the real time clock, choosing printer speeds and the like.

Another useful facility is that of being able to set a password, which has to be entered on power up before the machine becomes active. This sort of security can be very valuable in a portable business machine. A fifth ROM module containing a portable data base program called Cardbox Plus will be supplied with the production machine, though sadly this was not available for review.

Going back to the BASIC, for those of you who want an estimate of the speed of the machine, I ran the eight 'standard' benchmark programs. The results are displayed in Table 1. As you can see, the figures show that the machine doesn't exactly hang around.

THE FINER POINTS

For the two months I had the machine on loan, it performed extremely well. Incidentally, while using the PX-8, I found an article script about computer music that had been created by someone under Wordstar and left on the micro-cassette. It was very interesting!!! It also provided me with a good example of the sort of material that could easily be created and stored on this machine by an executive or writer, on the train home from an exhibition or seminar.

FACTSHEET

| | |
|-------------------------|--|
| CPU | Epson PX-8 CMOS Z80 (main)/CMOS 6301 (slave) |
| Clock | 2.45 MHz/614 kHz |
| RAM | 64K user plus 6K for video |
| ROM | 32K |
| Dimensions | 11¾" by 8½" |
| Keyboard | 72 key QWERTY type |
| Display | Built-in flip-up LCD display Text 80 by 8 Graphics 480 by 64 |
| Mass storage | Built-in microcassette Plug-in ROM capsules (maximum two, 8-32K per capsule) |
| I/O | RS-232C with selectable baud rate Serial port at 150, 600, 4800 or 38400 baud Barcode interface Analogue input Parallel system bus |
| OS | CP/M |
| Language | Microsoft BASIC |
| Bundled software | Portacalc spreadsheet and Wordstar word processor on ROM capsules |
| Expansion | 120K on RAM packs PF-10 3½" 360K battery disk drive (not yet available) TF-15 5¼" mains disk drive (not yet available) |
| Price | PX-8: £798 plus VAT 120K RAM pack: £270 plus VAT |

I found the documentation supplied (four thick books) both adequate in quantity and pleasantly clear in quality, though I have to say that I have used CP/M, MBASIC and Wordstar many times before and so should not have had any difficulty in any case.

The keyboard is well laid out and the keys have a good positive feel. One particularly nice feature is the facility to change the function of a block of the keys so that they double up as a numeric keypad.

The micro-cassette unit, though small in appearance and slow in operation, performed extremely reliably and did not fail once during the review period. The only disappointment about this machine concerned the liquid crystal display. This consists of 480 by 64 individually addressable pixels, normally arranged as eight lines of 80 characters. The problem with the display is one of readability. Most large LCDs seem to suffer from this problem, but the Epson is not too bad if the general level of room lighting is fairly bright. Another

common problem of these displays is the length of time they take to update. This can be appreciable particularly at low temperatures, but in the recent heat wave the Epson gave me no problems on this score.

CONCLUSIONS

The PX-8 provides sturdy battery-powered hardware with a good full-sized keyboard in an A4 sized machine. The LCD is plenty big enough for most purposes, though readability might be a problem in dim light conditions. The micro-cassette is very reliable, but slow. To overcome this speed problem, most users will probably fit disks or, for portable use, the 120K RAM disk pack.

Even with the RAM disk pack, the price of this CP/M machine with the standard selection of software is under £1000. This has to represent good value for money by any standards. All in all, the PX-8 is an impressive system easily capable of taking on tasks traditionally requiring a desk top full of kit.

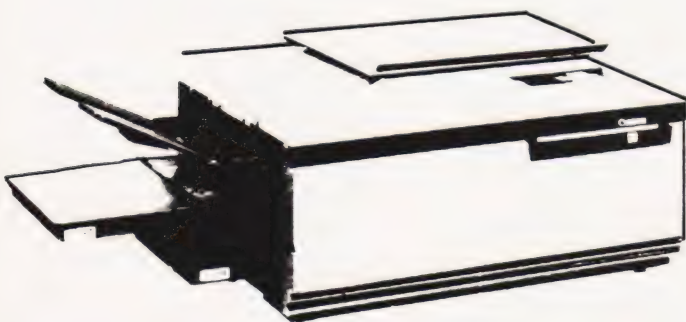
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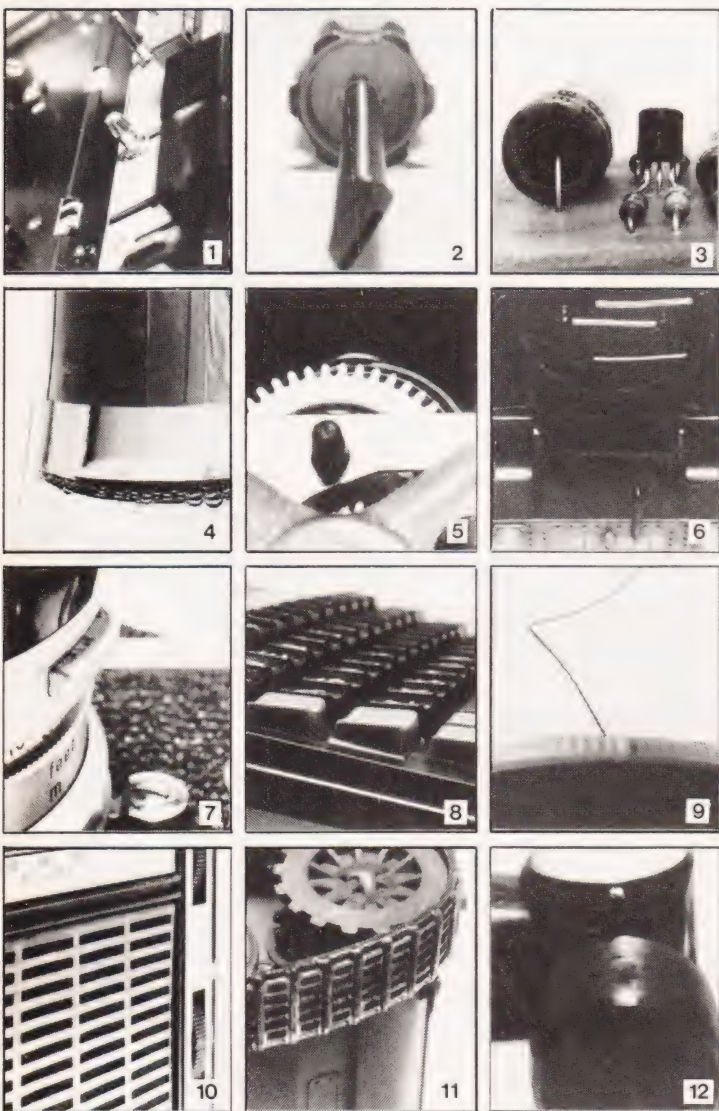
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The 12 objects are

| | | |
|----------|----------|----------|
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| 4. | 5. | 6. |
| 7. | 8. | 9. |
| 10. | 11. | 12. |

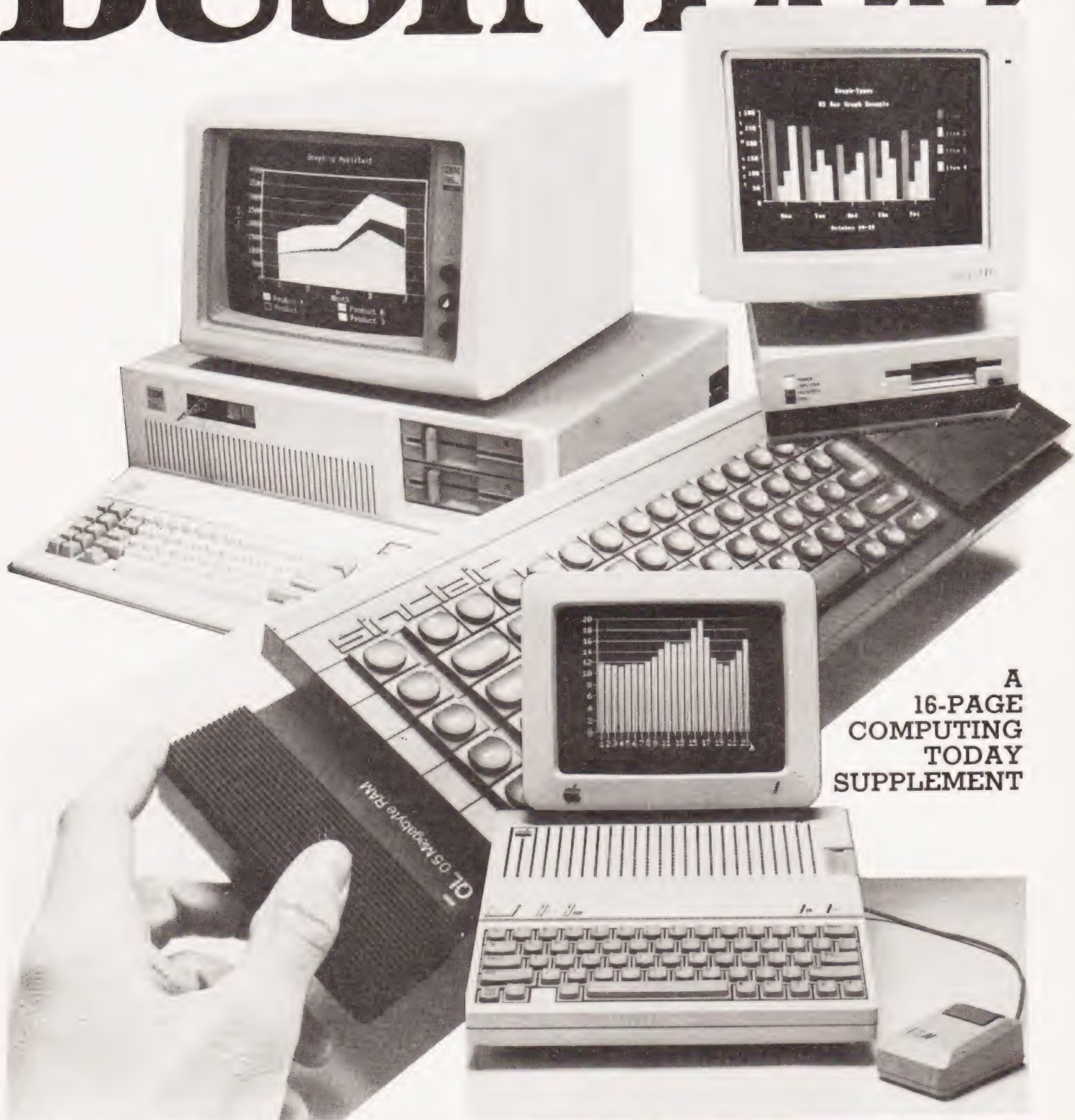
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Henry Budgett

So you've decided you need a personal computer for your business — now what do you do? Well, the best first step would be to read this feature on how to shop, then browse through our factsheets and comparison table.

Buying a business computer is a subtle blend of knowing what you need and which software it will run on. One without the other, as many an unwary purchaser has found, gives you a very expensive heap of junk. The first, and without doubt the most important, thing that a computer buying businessman needs to do is to establish just what he or she needs the computer to do. If you cannot establish what the computer will do that an existing manual system cannot achieve, you've probably talked yourself out of buying one!

Assuming, however, that you can realistically justify the requirement, why else would you be reading this? — it is now time to sit down again and work out just what you expect the machine to handle. If, for example, you are doing a lot of repetitive letter writing, then a word processing package is an obvious must. Add to that the fact that you are always writing to the same people and a utility to maintain a computerised address book and and take addresses from it automatically becomes a necessity too.

NOW DOUBLE IT

Clear, logical thinking about your requirements, even down to the number of lines each address needs or the amount of clients your company deals with will provide you with a master requirement. Now add at least as much again: you are, after all, planning to expand now you've got over the manual bottleneck! At this point we haven't considered a single proprietary package, program or computer by name or implication. This is a deliberate choice, what you have to do now is to find the ones that can meet your

requirements.

Here, at last, is the point where you start to look at the various options available in the High Street multiples or the specialist retail shops. Take only the specification and get one of the shop staff to try to assemble a package of hardware and software that will meet it. If they cannot be bothered or just say that one machine or another will do anything you want, leave quietly and try elsewhere. Until you can see a system performing the types of tasks that you need, don't even begin to think of ordering, let alone paying.

ELIMINATIONS

It is likely that, by the end of a week or so of traipsing around, you will assemble a shortlist of computers and software packages. Now, and only now, can the elimination process begin. Check the various contenders for price, service, backup in this country, number of other packages that will run on them, expandability and so on. Read the various reviews to see if any have known faults and sooner or later you'll end up with, at least, two or three systems that appear to offer what you want.

Now is the time to return to the outlet or dealer who offers the best price on the machine and present your shopping list. As a minimum requirement you will be looking for a system with two disks, a keyboard and screen, a printer and the necessary software. Add to this the immediate consumables like floppy disks, printer paper and ribbons and ask to see the whole thing demonstrated running the software you want in the way that you will be using it. Once again, if the dealer is unhelpful, take your custom elsewhere — after all, you will be paying at least £1,000 and

maybe much, much more. Lack of service at the start is usually an indication that if things do go wrong you'll face even worse when you try to get your computer fixed or the software updated.

The second buying criteria is to see if you can get the whole lot at one time and in one place. This apparently trivial requirement is often a severe problem for smaller outlets who cannot afford to hold large amounts of stock. Going to a bigger dealer, and perhaps, paying a fraction more could be a worthwhile investment in terms of service and backup.

The sheer time and effort involved in doing all the above yourself may persuade you to acquire the services of a consultant. Just as with the hardware and software there are good and bad in this field too. The national network of Microsystems centres run by the National Computing Centre in Manchester is probably the place to start; their prices are reasonable and they tend to stick with the accepted market leaders rather than recommending cut-price but possibly problematical alternatives. The consultant will require a good deal of your time as all the initial analysis of how you operate and what you are expecting to gain from a computer will still need to be accomplished.

WARNINGS

There is a great temptation these days to buy a ready-to-run computer which comes with bundled software. Reason seems to suggest that you'll be able to get by with the standard software. Sure, you'll get by but it's rather like buying a racing bike and fitting it with 3-speed gears — you'll never get the best out of it! Regard the free software as just that. Should it turn out to

be perfectly adequate then you've made a little on the deal but always be prepared to buy the exact product that you need, even if it costs a little more.

Beware, too, of the seductive charms of the integrated package. These are, in general, the music centre of the software world in that they offer a collection of packages within a single wrapper. You might expect to get a word processor, a data base and a spreadsheet with, perhaps, a graphics package thrown in for good luck. In general you find that the power of the parts isn't equal to the sum of the whole.

One classic example is the Appleworks packages for the IIe and IIc systems which offer an excellent word processor, data base and spreadsheet but doesn't allow the word processor to use names and addresses in the data base to generate form letters! It must, in fairness, be stated that some of the integrated packages do offer a simple and viable solution to many user's needs but a better solution is to take the manager approach. Here a single piece of software allows you to use a number of quite different products as though they were integrated, the best of both worlds.

Buying a business computer can be likened to buying a house. Once you've moved in and arranged everything to fit it's lovely. The trouble comes when it's time to move to a larger one. Sod's Law determines that you'll have to leave the carpets, curtains and a whole lot besides behind when you move. Computers are much the same so it's important to look forward and ensure that you can, at the very least, take the precious data with you when move to a newer or bigger machine.

MANUFACTURER

IBM

UK SOURCE OF SUPPLY

IBM authorised dealers

PRICE

£1,998 (ex VAT) to £4,140 (ex VAT)

BUNDLED SOFTWARE

Depends on dealer

OPERATING SYSTEM

PC-DOS (MS-DOS converted for IBM) or CP/M-86

GENERAL DESCRIPTION Just the announcement that IBM was to enter the personal computer market rocked several major hardware manufacturers back on their heels. While the US market held its collective breath and waited to see just what would happen, the UK just got on with its business. The delay in introducing the PC over here meant that the ACT Sirius (the now defunct Victor 9000 in America) had effectively stolen the show.

HARDWARE The system can be configured according to the user's requirements: you can start with a single 320K disk and 64K or go the whole hog and have a 10Mb Winchester, 512K of RAM and a 320K floppy disk — prices vary accordingly too!

Based on Intel's 8088 8/16-bit processor, the system breaks no new ground at all except, possibly, in the provision of a really excellent keyboard that everyone else is now copying. The keyboard is certainly well equipped with numeric, cursor and function pads; it offers just about everything you are ever likely to want, but make sure that the software you buy makes good use of it. The basic machine supports an 80-column monochrome display. Colour is available as an optional extra, but beware of some versions as the scrolling has a 'bug' which makes it pretty awful to watch. Peripheral support includes a parallel printer interface (IBM's PC Printer is really an Epson) but serial communications, joysticks and the rest come as extras.

The graphic display formats vary according to whether you're using black and white or colour; the resolution is 640 by 200 in monochrome, 320 by 200 in colour. IBM's graphics system uses all eight bits of each byte in the video RAM so each character has an extra byte associated with it to determine whether it's underlined, highlighted, inverted, and so on. The colour card supports eight background and 16 foreground colours and the extra expense is well worth it if you're into pretty graphics.

SOFTWARE Given IBM's corporate muscle, it comes as little surprise to find that if you want to use any of the industry-standard packages you'll find them on the IBM — just don't expect to find any bells or whistles attached. The limited processing power makes it the 1984 equivalent of a 1982 Z80+64K+CP/M system. Some light relief is added, however, because as well as writing the PC-DOS operating system, Microsoft threw in one of the best pieces of software ever written — Flight Simulator.

MARKET SECTOR In the UK the machine is regarded as a strictly business or professional computer and is almost certainly meeting resistance from the likes of Apricot, Sirius and Macintosh. It has done well though, in spite of its delayed arrival, and a loan from your bank manager is much more likely if the computer has a name he already knows. One wonders what kind of revenge IBM may be planning on Apple for their leap into 32-bit technology with the Macintosh. If IBM can produce a rival, even if it's in two year's time, the whole vicious circle could start all over again. Just how many companies could survive that upheaval...

SUPPORT The IBM PC may have a massive market penetration but that's due more to the third party support than their own efforts. Companies have used IBM's name as a vehicle to their own success, a marketing strategy that Apple have consistently used with their systems.

Much of the support on the hardware side has been stifled by IBM's limited expansion facilities but the growth of the clone market has produced some remarkable add-ons; there's even an

IBM PC



Apple emulator! Software abounds from all corners of the globe, the advertising speaks of packages being introduced by the day.

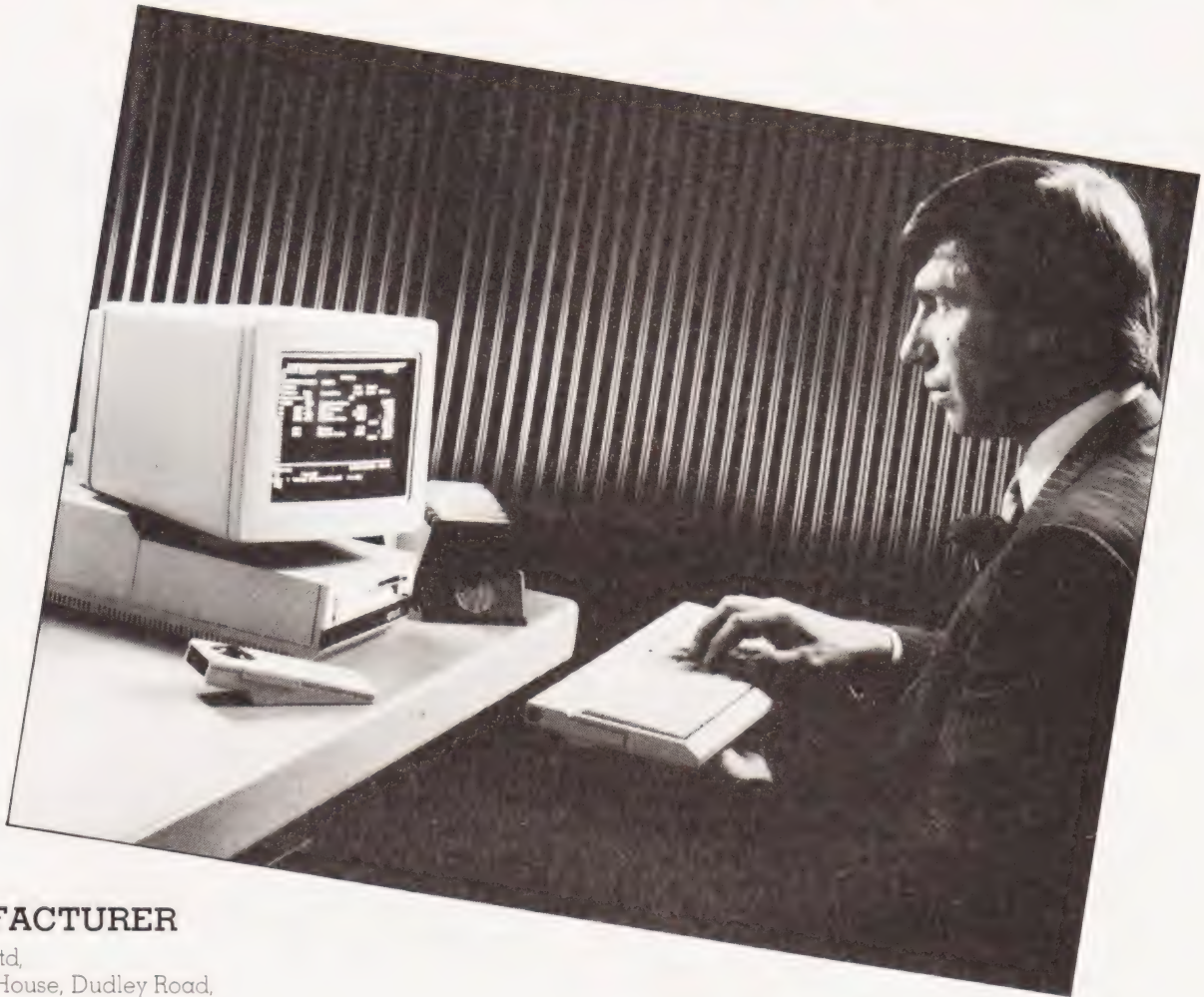
COMMENT The IBM PC simply has to be looked at in the context of being a workhorse computer rather than a high-performance machine. While it has certainly set the benchmark for the last year or so and acquired something like 30% of the total worldwide business market, the machine has no special technical features and in many ways looks just like an 8-bit CP/M machine of three years ago. However, just as those standards are still selling today so the IBM PC will be selling in five years time.

Today's generation of business systems are already well beyond the PC in technical capability and it looks increasingly as though the 32-bit processors will be the next standard. Much of the business sector is based on 8-bit architecture, even today, and it is a very strong possibility that they will upgrade directly to 32-bit machines. Although IBM's PCjr has had a disastrous start on both sides of the Atlantic, its recent re-vamp should make it a much more attractive entrypoint machine for the home/business user. It could just be that IBM knew what they were at all along and used the PCjr as market research to find out what the competition would do!

THE CLONES Possibly the biggest single measure of the machine's acceptance as the 16-bit standard is the sheer volume of the clone market. You can buy IBM look-alikes in portable as well as desktop versions from a dozen or so suppliers on both sides of the Atlantic. Even WH Smith are stocking a look-alike, the Ferranti-assembled Advance 86. Among the other, better known, systems vying for the PC buyer's attention are the Compaq range, Eagle's super fast Plus 2, Hyperion, Olivetti and the Televideo Tele-PC. While these are all highly compatible there are literally dozens of others including the new Encore from Osborne, Tandy's Model 2000 and the Graduate which turns your BBC Micro into a PC.

Quite how much these clones really do duplicate the original varies from maker to maker but as most come with bundled software anyway it doesn't really matter. The end user is unlikely to buy one of each and share the disks between them. Probably the single most used criterion for establishing the compatibility of a clone is getting the supplier to run Microsoft's Flight Simulator. While this is a good test in that it checks out the graphics, a much better assessment is to find the packages that you would want to run on the original PC and then ask for those to be demonstrated. Many software houses employ dodges and shortcuts to speed up the IBM which simply won't work on the chosen clone.

ACT APRICOT



MANUFACTURER

ACT (UK) Ltd,
Shenstone House, Dudley Road,
Halesowen,
West Midlands B63 3NT

UK SOURCE OF SUPPLY

ACT authorised dealers

PRICE

£1,495 (ex VAT) to £2,995 (ex VAT)

BUNDLED SOFTWARE

BASIC, COBOL, SuperCalc, Communications, Manager

OPERATING SYSTEM

MS-DOS, CP/M-86

GENERAL DESCRIPTION The Apricot's sleek design helped ACT set a new standard for neatness and portability in the business market. The idea of carrying your portable computer between monitors is, to say the least, an interesting one. Keep the 12" one at the office and the 9" one at home, you know it makes sense! Packaged into a very slim white case with its detached keyboard, the system both looks nice and handles well. The Sony 3.5" discs help keep the physical size down yet in terms of sheer power, the machine is at least equal to if not more powerful than its Sirius predecessor.

While ACT's original concept of a fully portable machine complete with flat-screen plasma-type display went out of the window at a very early stage, the advent of the new 80 by 24 LCD generation from Sharp and the like allowed ACT to produce the Rascal (see panel below).

HARDWARE Based on Intel's 8086 16-bit processor with 256K of RAM, the Apricot, despite its small size, offers considerable scope for expansion. If you need 'go-faster' maths, the 8087 co-processor can be fitted directly into the main PCB. The internal expansion bus can be used to expand the machine's memory capacity up to a total of 768K. Apart from increases to the Apricot's internal capacity, the single most popular expansion is likely to be the modem board which gives access to systems like Telecom Gold as well as remote contact with any other suitably equipped computer. They even throw the software in!

The keyboard does feel rather dead, the keys have a very short travel, and although it has all the function, cursor and numeric keys a user could want it somehow lacks the quality of the rest of the unit. On a personal experience note, the keyboard is the only part of either of my Apricots to give trouble; two replacements to date. This view is a highly personal one but as the keyboard is the sole source of interaction with the machine it's something to watch out for. ACT has fitted a mousehole to the side of the keyboard but, as far as I know, no suitable rodent has yet taken up residence.

ACT provide an asynchronous serial communications port and a parallel (Centronics) printer port. Both these can be configured under software control. In theory the machine should, therefore, be capable of communicating with almost any printer or modem. A standard Epson FX-80 printer connected to the Centronics port consistently produced extra line feeds regardless of any internal switch setting on the printer. The answer supplied by Epson proved to be to disconnect pin 14 — something that the manuals fail to mention.

The dedicated monitor displays the usual 25 lines of 80 characters which are bit mapped to give 800 by 400 pixels. ACT have also made much of their two-line LCD display on the keyboard called the Microscreen. By using six touch sensitive panels, the Microscreen acts as a set of function keys with programmable labels as well as being a clock/calendar and four-function calculator. Check the versioned software from third party sources to see whether they make use of the Microscreen. It can make the difference between being user friendly and boringly normal!

SOFTWARE Bundled in with the Apricot is (according to ACT at least) £750 worth of business software. The inexperienced user will find the Manager an extremely user-friendly device for configuring the system and loading various programs. The more computerate will probably find that the time saved by building auto-boot discs and ignoring it completely is well worth it! Also residing on the set of three disks are Supercalc, MBASIC, COBOL, the MSX graphics extension to BASIC and sundry other bits and bobs. You also get a bunch of vouchers entitling you to a free copy of Concurrent CP/M-86 and Personal BASIC plus money off the range of BOS software, UCSD Pascal and a Supercalc upgrade.

As well as the usual crop of third party packages there's always ACT's own Pulsar range (which, incidentally, is also available for the IBM PC). Of all their offerings, the most interesting must be the File Transfer System which allows Apricots, Sinii and IBMs to talk to one another and even lets Apples chip in with data files.

MARKET SECTOR Designed for the small business and professional market, the Apricot will also appeal to Sinus users looking to expand but still maintain compatibility. The innovative design and the decision to not quite follow the IBM trail has led to its warm welcome by the press on both sides of the Atlantic. While good reviews are not exactly money in the bank, there's enough evidence to show that the machine meets the requirements of a very diverse section of the market.

SUPPORT Alternative hard discs were available from third party suppliers before ACT got their own into the xi. Other hardware add-ons are promised from a variety of sources.

COMMENT Having specified the Apricot as our standard office system some seven months ago I've yet to find a good reason to make me change my mind. The two we have only failed once and that was through a dodgy keyboard assembly. The fact that the replacement failed was just bad luck. ACT's service was excellent — something that cannot be said for certain other companies.

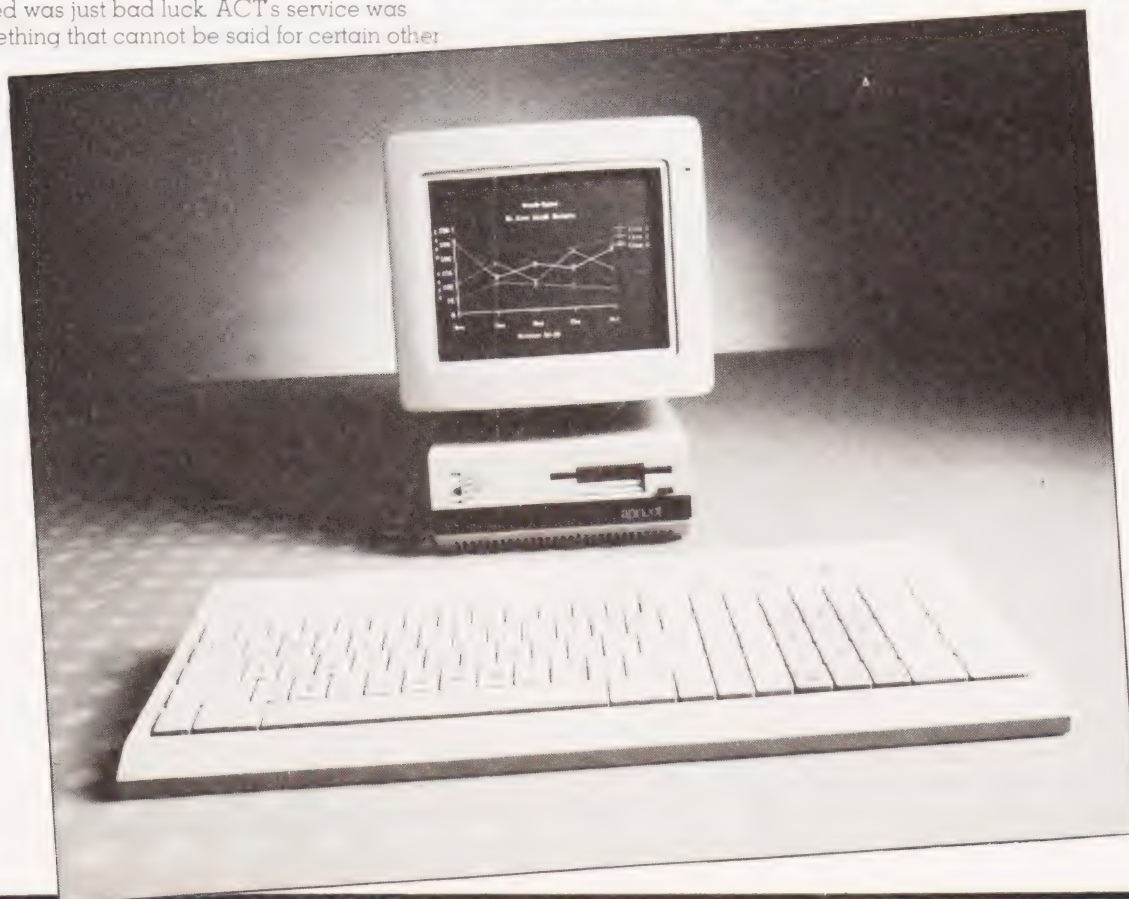
THE OTHER APRICOTS Following the successful introduction of the original Apricot, ACT followed with a double density drive version and the hard disk equipped xi series. A detailed review of the xi appeared in the August issue of *Computing Today* so I won't go over that ground again.

Reluctant to let a good idea slip, ACT has also introduced the Rascal series of Apricot compatibles. The Portable is a 13lb, Hitachi 80 by 25 LCD display equipped system, still mains powered, and look unlike almost any other computer you've ever seen. Among its impressive features are a double-sided 720K Sony disk, 256K of RAM and on-board speech recognition. It shares the scene with two 'half-Apricots', the F1 and F1E. While the Portable is priced at £1695, these are £995 and £795 respectively.

The Apricot Portable, claimed by ACT to be the most advanced around, packs 256K of RAM, a double-sided 720K 3.5" disk, speech recognition and an LCD display into the weirdest shaped box ever. The detached keyboard links by infra-red, as does the optional mouse/trackball. Providing speech recognition gives ACT a 'first' in the field and, from the specification at least, it looks pretty impressive. Any set of 64 words from a vocabulary of 4096 can be accessed at one time and both the ACT sourced packages supplied, Sketch and Diary, make use of the feature. The driver does require a whopping 55K but it is only loaded when the application is making use of the system.

Possibly the single most obvious pointer to the future of computers in general comes in the way that the LCD display is configured. You can use it in either text or graphics (640 by 256 pixels) mode and simultaneously obtain colour graphics from the normal video output. If the LCD is turned on it does restrict the number of colours supported (eight with it on as opposed to 16 when it's off) but the resolution is kept the same. What this allows you to do is to display text on the LCD, perfectly adequate for most normal applications, and simultaneously produce colour graphics on a conventional monitor.

Although the F1 and F1E look pretty much the same their internal configuration differs quite considerably. The bigger, and more expensive, F1 sports a single, double-sided 720K Sony drive along with 256K of RAM that can be expanded to 768K. The F1E has a standard 3.5" disk holding 315K and 128K of RAM but there is an optional expansion pack, called the Business Upgrade Kit, that provides a further 128K of RAM and MS-DOS.



The Apricot F1.



Black is beautiful: the Apricot xi, right, has an internal hard disk, while the new Portable, above, features an unusual design and voice recognition.



The system normally runs under the Digital Research CP/M-86 operating system.

Keyboards on both models are detached, like the one for the Portable, and use an infra-red link. ACT are happy that they have overcome the problems that dogged IBM's PCjr but just in case, they supply a 'light pipe' cable. Another detached peripheral is a 'solid state' mouse. Interestingly, this can be used upside down as well as a trackball, the ideal solution for the businessman who doesn't have enough room on his desk for a mouse rink. Further expansion is possible by adding a common box that allows up to five extra boards to be plugged into the system bus. Hard disks in both 5 and 10Mb Winchester formats are also available.

The use of colour graphics is one interesting facility provided on the F1 and F1E: 16 colours at a resolution of 320 by 256 or 4 colours at the maximum 640 by 256 resolution should give many systems a run for their money. Applications software is bundled in with all but the F1E and even that comes with Logo. Among the

packages are three from Sorcim; Superwriter, Supercalc and Superplanner as well as a sketching program and a diary keeper.

Of all the problems that have caused comment about the original Apricot, the most well-known is that of the slow disk access. There is no obvious technical reason why the 3.5" drives should be slower on the Apricot than in its other implementations, but the new machines have an upgraded BIOS in 32K ROM and, according to those fortunate enough to have tried it out, they now go much faster. The move to ROM also frees more memory for applications and in a standard configuration, that gives you about 210K to play with. Imagine an adventure with graphics that big...

Expect to see them in the dealers before the end of the Autumn but if you want one I'd put an order in now because at those prices, the F1 and F1E should shift faster than Seb Coe!

APPLE IIc

MANUFACTURER

Apple Computer (UK) Ltd,
Eastman Way,
Hemel Hempstead,
Hertfordshire HP2 7HQ

UK SOURCE OF SUPPLY

Apple dealer network

PRICE

£925 (ex VAT)

BUNDLED SOFTWARE

Applesoft BASIC in ROM, six-disc training course

OPERATING SYSTEM

ProDOS or DOS 3.3

GENERAL DESCRIPTION When Apple launched the IIe last year and then quietly introduced a whole load of extras from mice to hard disks earlier this year it became obvious that something else was in the works. The 'something' turned out to be the IIc, the biggest potential seller in the portable market yet. Based on the IIe's architecture and including a long-overdue upgrade to the disk operating system, the designers squashed everything but the display into a 7.5lb, 12" by 11.25" by 2.25" box. Display options include a matching style 9" monochrome monitor, TV, colour monitor or an 80-column by 24-line LCD display — although the latter probably won't be available until the end of the year.

As a computer the IIc is hardly a radical new design; the original Apple was, after all, designed in 1976. However, as a package it is intended to introduce disk-based computing to every sector of the market. In designing the mouse into the IIc itself, Apple are also educating the user about such things as icons and pull-down menus. This makes them into potential Macintosh or Lisa owners — long-term strategic planning on a grand scale? The original II and its update the II+ may never have sold in huge volumes (two million units worldwide since its launch in 1977) but Apple is banking on shifting an almost unbelievable one million units of the IIc this year.

HARDWARE The external design is very neat indeed — the stylists were responsible for the Walkman — but the choice of white as a casing colour is a little strange; it gets dirty very quickly. Internally, the machine looks just like a fully expanded IIe but with the obvious difference that all the major functions have been 'chipped'. Based on a CMOS version of the faithful 6502 processor along with 128K of RAM, the hardware offers a full 80-column display, two serial ports, a mousehole and an expansion port for the second disk.

Although the disk holds its usual 143K, the 5¼" format was maintained for compatibility although 3.5" drives may well appear as add-ons. ProDOS, the new disk operating system, is around eight times faster than the previous DOS 3.3 although the latter is still supplied. Apple software generally carries the appropriate DOS with it on the disk so it doesn't matter which you use as long as you don't mix them. The keyboard features all the extra keys found on the IIe and the whole unit can be propped forwards to make it easier to use.

The designers also boosted the graphics capabilities to 560 by 192 pixels, double that of the IIe, and provided 16 colours rather than the normal eight. Sadly, they still left us with the revolting colour mixing problem that makes Apple high resolution text look like a technicolour snowstorm.

SOFTWARE The one thing that the Apple II series has going for it compared with its many 8-bit rivals is the sheer volume of



software that it can run. While many computers are launched with a dozen or so packages, the IIc, on its day of release, was estimated to have a staggering 18,000 proven packages! Of these, and all the household names are in the list, the biggest seller is likely to be Apple's own integrated package, AppleWorks. This consists of a word processor, data base and spreadsheet and for £175, it knocks spots off all its rivals. It has its shortcomings; the word processor cannot use data base files to create form letters, but for the average user it provides all the functions he or she is ever likely to need.

Launched at the same time were new versions of Pascal, Logo and Access II. For reasons known only to the management at Hemel Hempstead only the last of that list has yet arrived on my desk and the order has been in since about April. Quite how the management re-shuffle up there has affected the operation is not yet apparent but fingers do need to be extracted!

The biggest worry of all about the IIc is that some of the best-known packages simply won't work. New versions are being created but the time lapse between launch and availability may give the machine a slower start than Apple are hoping for.

MARKET SECTOR Apple's own sales pitch is that the IIc is 'For work. For home. For everywhere in between.' It would take someone a whole lot braver than me to try to argue with that!

SUPPORT Apart from adding a printer, Apple launched two new low-cost ones and a modem at the same time so there's not a lot you really need to add. The system internal expansion capability of the II+ and IIe simply isn't there, so extra cards and second processors cannot be added (by conventional means at least). Both the normal complaints against the original Apples — not enough memory and only 40-column display — are dealt with internally.

COMMENT Being a dedicated IIe user, the launch of the IIc made me look seriously at having a second system to carry around. Sadly, the packages I use most of all; Applewriter, Multiplan, Cardbox and Brainstorm, just won't move across! The first pair really need two disks while the second pair are CP/M-based and I can't fit a second processor.

While my particular needs weren't met by the machine, the IIc undoubtedly has mass appeal and the sheer volume of software that will work means that the machine should do very well indeed, although I see it being used more as a super home machine than a business tool.

COMPARISON TABLE

| Macintosh | Apple IIc | IBM PC |
|--|--|--|
| 68000 32 | 65C02 8 | 8088 8/16 |
| 128K 512K | 128K 128K | 64K 768K |
| 64K | 12K | 40K |
| Mechanical 58 Optional No No | Mechanical 63 No Keys only No | Mechanical 83 Yes Yes 10 |
| 9 inch mono - As required 512 by 342 Being developed - | Monitor/TV Optional 24 by 40/80 - 560 by 192 16 - | Monitor - 24 by 80 640 by 200 Optional Mode dependent - |
| - 2 Supplied Polyphonic - | - 2 1 Interface only Beep only - | 1 Optional Optional Third party Beep only Yes |
| Apple's own 1 - Expected Second disc - | ProDOS/DOS 3.3 - 1 - Second disc - | PC-DOS - 2 Optional Yes - |
| Supplied Selection Selection Selection Supplied Selection | Selection Selection Selection Selection Selection Selection | Selection Selection Selection Selection Selection Selection |
| Yes - Yes Yes Yes | Supplied Yes Yes Yes Yes | Supplied Yes Yes Yes Yes |
| Yes Yes | As portable Yes | Yes Yes |
| £1795 | £925 | £1805 |

| IBMPCjr | ACT Apricot | ACT Portable | SYSTEM PROCESSOR |
|---|--|--|--|
| 8088 8/16 | 8086 16 | 8086 16 | Device Number of bits |
| 64K 128K — | 256K 768K — | 256K 768K 32K | MEMORY Total RAM Maximum RAM Total ROM |
| Chiclet 62 No Yes No | Mechanical 96 Yes Yes 6 | Mechanical 92 Yes Yes 10 | KEYBOARD Keyboard type QWERTY keys Numeric pad Cursor pad Function keys |
| Monitor 24 by 80 640 by 200 640 by 200 Mode dependent | Monitor Microscreen 24 by 80 800 by 400 | LCD flat screen Monitor Integral 25 by 80 640 by 256 640 by 256 Mode dependent | DISPLAY Integral display External display LCD/Plasma display Text Monochrome graphics Colour graphics Available colours Sprites |
| 1 Optional Optional Beep only Yes | 1 1 Optional Beep only Yes | 1 1 Optional Beep only Yes | INTERFACES Parallel Serial Joystick Mouse Sound Expansion bus |
| PC-DOS 1 Yes | MS-DOS CP/M-86 2 Optional Yes | MS-DOS CP/M-86 1 Optional Yes | STORAGE DOS 3.5 disc 5.25 disc Winchester Expansion Microdrive |
| Selection Selection Selection Selection Selection | Selection Selection Supplied Selection | Supplied Selection Supplied Supplied | SOFTWARE Wordprocessor Data Base Spreadsheet Graphics Games |
| Supplied Yes Yes Yes Yes | Supplied Yes Yes Yes Yes | Supplied Yes Yes Yes Yes | LANGUAGES Interpreted BASIC Compiled BASIC Pascal Assembler Others |
| No Yes | Yes Yes | Yes (as portable) No | APPLICATIONS Business Home/Business |
| — | £1395 | £1695 | ENTRY LEVEL PRICE |

| ACT F1 | Commodore SX64 | Osborne 01 | Osborne Executive |
|---|--|--------------------------------------|--------------------------------------|
| 8086 16 | 6510 8 | Z80A 8 | Z80A 8 |
| 256K 768K 32K | 64K 64K 26K | 64K 64K 4K | 64K 64K 4K |
| Mechanical 92 Yes Yes 10 | Mechanical 66 No Keys only 4 (8 functions) | Mechanical 69 Yes Yes No | Mechanical 69 Yes Yes No |
| Monitor 24 by 80 640 by 256 640 by 256 Mode dependent | 5inch colour Monitor 25 by 40 320 by 200 16 8 | 5inch mono Monitor/TV 24 by 52 | 7inch mono Monitor/TV 24 by 80 |
| 1 1 Optional Beep only Yes | 1 2 3 channels 0 | 1 2 - | 1 2 - |
| MS-DOS CP/M-86 1 Optional Yes | Commodore's own 1 Yes | CP/M 2 | CP/M 2 |
| Supplied Selection Supplied Supplied | Supplied Supplied Supplied Selection Selection | Supplied Supplied Supplied | Supplied Supplied Supplied |
| Supplied Yes Yes Yes Yes | Supplied Yes Yes Yes | Supplied Supplied Yes Yes | Supplied Supplied Yes Yes |
| Yes Yes | As portable Yes | As portable Yes | As portable Yes |
| £995 | £895 | £795 | £1295 |

| Osborne Encore | Sinclair QL | Grid Portable | SYSTEM PROCESSOR |
|---|--|---|--|
| 8086 16 | 68008 8 | 8086/8087 16 | Device Number of bits |
| 128K 512K - | 128K 640K 32K (48K) | 256K 512K 16K | MEMORY Total RAM Maximum RAM Total ROM |
| Mechanical 63 Yes Yes 10 | Membrane 65 No Keys only 5 | Mechanical 57 No No No | KEYBOARD Keyboard type QWERTY keys Numeric pad Cursor pad Function keys |
| LCD flat screen - Integral 16 by 80 480 by 128 - - - | - Monitor/TV - 25 by 85 - 512 by 256 Mode dependent - | Electroluminescent - Integral 24 by 80 320 by 240 - - - | DISPLAY Integral display External display LCD/Plasma display Text Monochrome graphics Colour graphics Available colours Sprites |
| 1 1 - - - - | Promised 2 2 - Yes Yes | GPIB (IEEE-488) 2 - - - Yes | INTERFACES Parallel Serial Joystick Mouse Sound Expansion bus |
| MS-DOS - 1 - Yes - | QDOS - - Promised Microdrive only 2 | Grid-OS/MS-DOS - Optional Optional Discs via server - | STORAGE DOS 3.5 disc 5.25 disc Winchester Expansion Microdrive |
| Supplied Selection Selection Selection Selection | Supplied Supplied Supplied Supplied Promised | Optional (in ROM) Optional (in ROM) Optional (in ROM) Optional (in ROM) - | SOFTWARE Wordprocessor Data Base Spreadsheet Graphics Games |
| Selection Selection Selection Selection Selection | Supplied No Promised Promised Promised | - - Via server Via server Via server | LANGUAGES Interpreted BASIC Compiled BASIC Pascal Assembler Others |
| As portable Yes | Unlikely Yes | Yes (as portable) No | APPLICATIONS Business Home/Business |
| Available November | £399 | £3595 | ENTRY LEVEL PRICE |

APPLE MACINTOSH



MANUFACTURER

Apple Computer (UK) Ltd,
Eastman Way,
Hemel Hempstead,
Hertfordshire HP2 7HQ

UK SOURCE OF SUPPLY

Apple dealer network

PRICE

£1,795 (ex VAT)

BUNDLED SOFTWARE

Launch offer includes MacWrite and MacPaint

OPERATING SYSTEM

Apple's own

GENERAL DESCRIPTION Based around the 'desktop-metaphor' concept developed for its fore-runner, the Lisa, the Macintosh or Mac — as it is affectionately known — must be about the most idiot-proof machine yet. Keyboard operation is kept to a minimum and by using the mouse as a super-fast set of cursor keys, the main functions of the computer and, more importantly, the accompanying software are controlled by screen symbols, called icons. For the total computer novice this is an excellent way to do

things. Unfortunately, the computer literate may well find constantly moving between keyboard and mouse and back again to perform the most trivial of tasks somewhat irritating.

Existing Lisa users can gain full compatibility with the Macintosh through a package called MacWorks or they can get the two systems to communicate through a promised, but not yet delivered, local area network. In both the USA and the UK the machine has smashed its projected sales figures and in America it reduced IBM's struggling PC junior to an also-ran. It undoubtedly has some quirks that the experienced may find frustrating but it isn't really aimed at that sort of marketplace.

HARDWARE With its architecture based on Motorola's 32/16-bit 68000 processor (the bigger brother of the QL's CPU) the Mac comes in a superbly designed and compact package. Its 'footprint' — Americanese for how much desktop space it takes up — is not that much bigger than a telephone. Its overall dimensions are 10.9" by 9.7" and it stands just 13.5" high. The detached keyboard is also pretty tidy but the mouse, on the other hand, takes up more space than the conventional, full-sized keyboard of something like an IBM!

All the main electronics are packed onto just one PCB with a second providing the monitor drive and power supply. Possibly the single most important chip after the CPU is a 64K ROM which contains all the routines to handle icons, windows, pull-down

menus and so on. Apple have only provided 128K of RAM. If this seems rather small it's because they are waiting for the new 256K bit RAM chips before they produce the 512K version called FatMac. (Presumably a rather prominent fastfood chain had prior claims on the other possible name!) A 9" high resolution monochrome monitor is also packed into the box and this supports 512 by 342 pixels. All displays are produced on a pixel basis, even the text, and that's why the output looks so good. According to American media sources, Apple are planning a colour version (something that had been strongly denied at the launch) but don't expect to see it for about a year. One of the companies supposed to have received a prototype is Lucasfilm. I wonder what they are going to use it for...

A single Sony 3.5" disk is built in and this holds some 400K — a second, external, drive is supposed to be available but the demand for the machine has meant that most of the drives are being used to make Macs and not add-on units! Apart from this second disk, Mac has interfaces for its mouse, two serial ports (one for the Imageprinter, the other for communications) and a polyphonic sound port. Oh, and there's an on-board clock/calendar too!

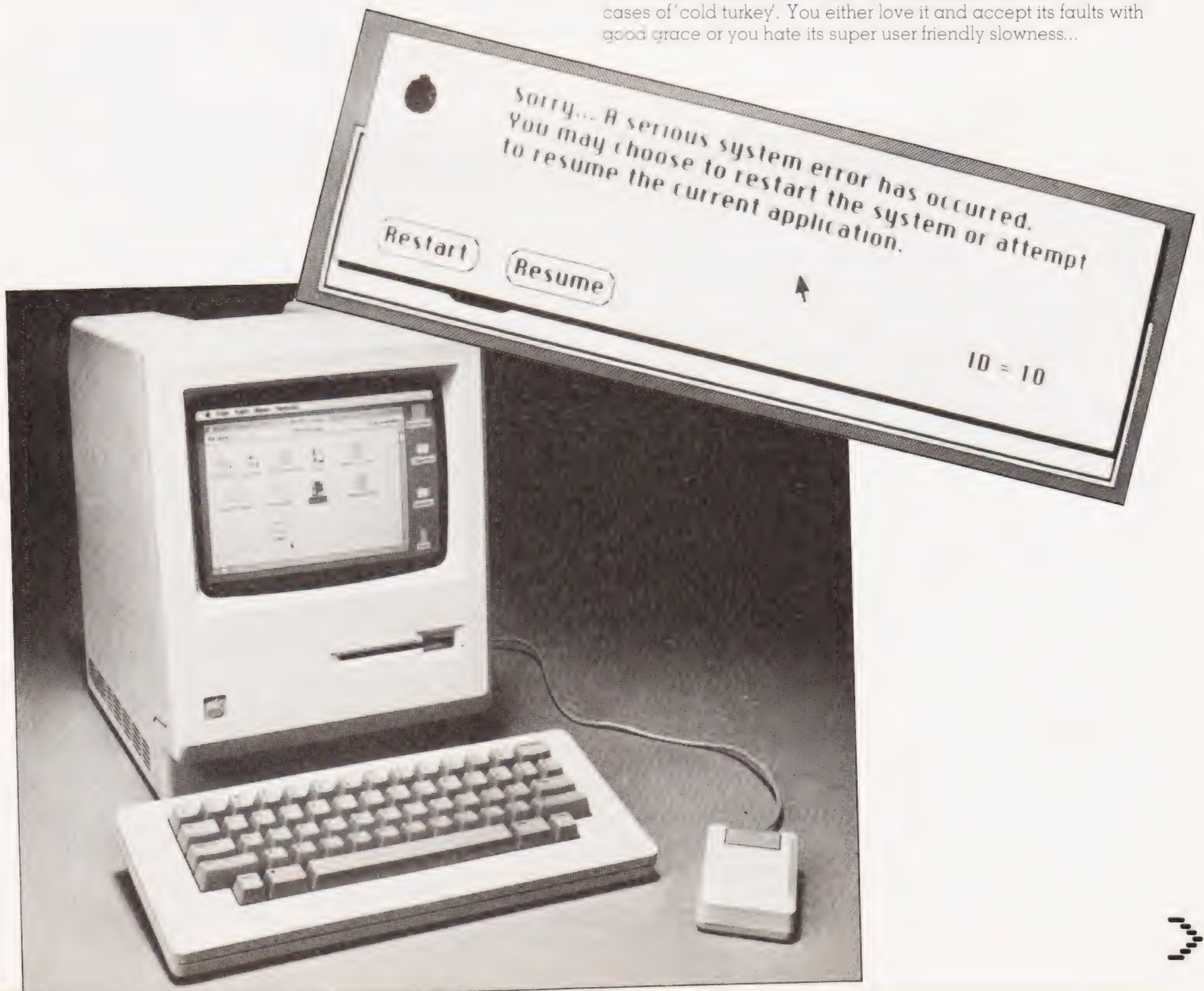
SOFTWARE The Macintosh comes complete with MacWrite (a fairly limited word processor) and MacPaint during the launch period, but virtually every best-seller that the business market has ever seen is scheduled for release soon. Included among these promised and 'soon-to-be' products is the best (in my opinion at least) spreadsheet on the market, Multiplan from Microsoft. Of the languages that are promised only BASIC and Forth are currently available (an American software house has just started shipping a version of C) but there's a whole lot more to come from Pascal

and beyond. Currently the major software developers are being encouraged to do it on Lisa in C and move it across in machine code, but Apple announced recently that an assembler/editor/debugger will be available for Mac later this year. All this support for a product that wasn't even complete at the time the deals were struck speaks volumes for the industry's faith in the new machine. Time alone will tell if it has been justified.

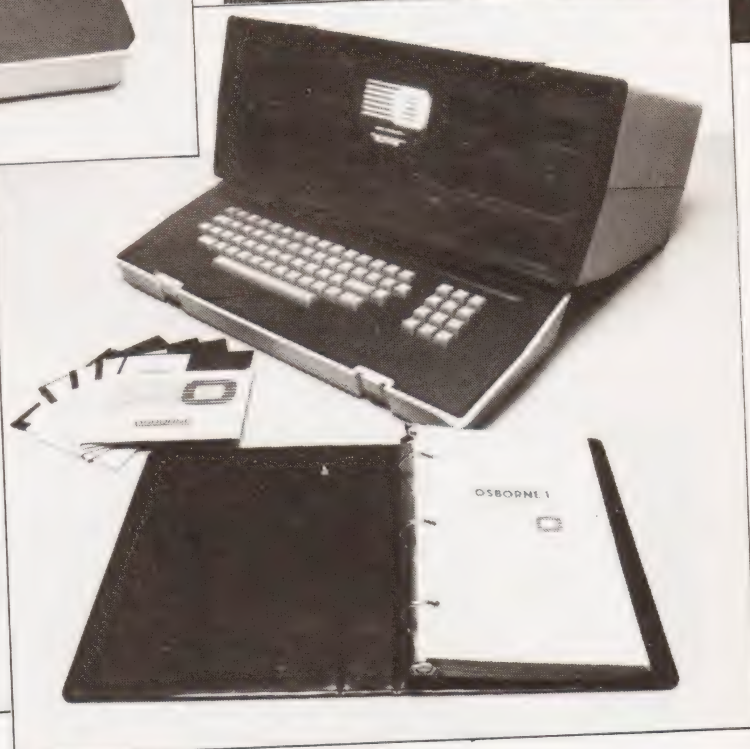
MARKET SECTOR Apple themselves have targeted their campaign directly at the 90% of the business sector who have no personal computing system. However, its price may also make it appealing to writers, designers and so on who were thinking of buying a top-end home/business computer. Apple also follow the same 'brand loyalty' strategy that Jack Tramiel used to preach when he was head of Commodore. The philosophy that today's student will become tomorrow's corporate decision makers is far from being a bad one. It also means that students get cheap hardware which is no bad thing in itself.

SUPPORT Apple's policy of supporting third party development of both hardware and software is already running in overdrive for the Mac. There are hard disks, plotters, printers and a whole bunch of other add-ons but at the moment few have made it across the Atlantic. If you want it and Apple doesn't supply it try one of the specialist dealers like Pete & Pam (now, somewhat boringly, known as P&P Micro Distributors) or Personal Computers and they'll probably be able to find it.

COMMENT Macfever can be catching! You can spot the symptoms by keeping an eye on your post or inter-office memos as Maclovers can't resist covering documents with pretty little doodles and multiple font styles. The disease, sadly, has no known cure and removal of the offending object can cause severe cases of 'cold turkey'. You either love it and accept its faults with good grace or you hate its super user friendly slowness...



OSBORNE 01/ EXECUTIVE



MANUFACTURER

Osborne UK,
38 Tanners Drive,
Blakelands North,
Milton Keynes,
Buckinghamshire MK14 5LL

UK SOURCE OF SUPPLY

Multiple Outlets

PRICE

£945 (ex VAT) to £1,595 (ex VAT) but watch for bargains!

BUNDLED SOFTWARE

WordStar, Mailmerge, SuperCalc, MBASIC, CBASIC (plus others!)

OPERATING SYSTEM

CP/M-80 (CP/M Plus on the Executive)

GENERAL DESCRIPTION This is the original portable business computer conceived by expatriate Adam Osborne that everyone thought was doomed to instant failure and then scrambled to copy. Following a couple of years of 'Hypergrowth', the Osborne empire collapsed although the UK operation survived remarkably unscathed and even the American parent looks set to rise, Phoenix like, from its ashes.

The actual machine was no innovation, it was just a portable version of a standard CP/M system. The reason many of its opponents regarded it as a serious threat was because of the bundled software. Included in the already very reasonable price were WordStar, Mailmerge, SuperCalc and two versions of BASIC. To buy the software on its own would have cost the end-user nearly as much again as the hardware yet Osborne was giving it

all away for free. The results of this direct challenge to the way the computer makers had previously done business are still being seen today.

HARDWARE A traditionally designed Z80 with 64K of RAM — Osborne himself described it as being 'plain vanilla' — the O1 didn't exactly break new ground. What interested the business community, though, was the way that the complete system with its 5" monitor, twin disk drives and detached keyboard were packed into a luggable 24lb box.

The CP/M implementation suffers slightly as a result of the puny 100K per disk storage capacity. Later versions of the machine had the option of double density drives. The use of a fully memory mapped screen (so scrolling can be achieved to compensate for the reduced viewing area) means that the user only gets 54K for applications programs.

SOFTWARE In the unlikely event that the user should be unsatisfied with the bundled packages he or she got for free, virtually any standard CP/M package will run on the Executive. The smaller screened O1 works best with software tailored to its scrolling window system but you could always use a full-size monitor screen which supports the full 80 columns. If the machine is going to be used as a stand-alone computer rather than as a portable, it is probably safer to go for the more expensive Executive.

MARKET SECTOR As the original business portable machine supplied with bundled software, the O1 (and to a lesser extent the Executive) have already taken their slice of the available market. Following the US collapse and the subsequent down-pricing, the machine now has considerable appeal for the growing home/business sector and even offers good value to the serious home user. Quite how long this momentum will last may well be determined by the remaining stock of machines. But for anyone looking for a CP/M based portable with industry standard software then this has to be the machine to buy — provided you get a cast-iron guarantee of service.

SUPPORT Apart from upgrading an older system to double

density disks or adding an 80-column facility, there isn't a lot that you really need to add. A printer and a modem are about the only two obvious extra peripherals and there are plenty of those to choose from.

COMMENT Before journalists were seduced by the Tandy 100 and its various clones or the new Epson PX-8, this was the machine we tended to drag around with us. Time has passed the original concept by but the value for money aspect still operates in its favour, especially if you want access to the vast CP/M library and occasionally need to move the beast from place to place.

THE NEW ENCORE As promised, Osborne released their IBM PC-compatible portable earlier this year. Ingeniously designed to look like a sewing machine case, the Encore uses a 16-line LCD display (the 25-line ones weren't available at that time but the system can, and will be upgraded when they are) and features a CMOS 8086 with 128K of RAM. Supplied as standard with a single disk, there are options for a second drive and a RAM (or cache) disk to be fitted.

For the man or woman on the move, there's also supposed to be a built-in modem and the whole thing can be powered from a battery pack which gives about five hours use. One hopes that the ghost of the original O1 battery pack has been laid to rest — it never appeared! Standard interfaces supplied are Centronics for parallel printers and a serial port for anything else like external modems or communications.

On the software side, the system runs under MS-DOS and is supposed to be fully compatible with 'well-behaved' IBM software. What this effectively means is that it will only run software that has been written to obey the rules: the 16 line screen restriction will introduce problems of its own anyway. Interestingly, Osborne have 'forced' the Lotus 1-2-3 package to operate correctly by writing a special boot program. The only bundled software is NewWord, a Wordstar look-alike, but by the time it becomes available in volume there may be more. Expect to pay around £1,500 for it and, with a full 25-line display, it both looks and feels like a very good value product indeed.



COMMODORE SX-64

MANUFACTURER

Commodore (UK) Ltd,
675 Ajax Avenue,
Slough,
Berkshire

UK SOURCE OF SUPPLY

High Street/dealer network

PRICE

£895

BUNDLED SOFTWARE

BASIC 2.0 in ROM, EasyScript, EasyFile, Future Finance

OPERATING SYSTEM

Commodore's own

GENERAL DESCRIPTION Designed around the existing hardware of the popular Commodore 64 home computer, the SX-64 was Commodore's shot at tackling the portable/business sector. Whereas the original home system was well suited to its market with graphics, sprites and sound, the latter two of those facilities have little if any real application to the serious businessman.

Pitched into a market dominated by the likes of Osborne, Compaq and Hyperion, the machine arrived too late in this country to challenge the serious end of the market. Add to this the launch of the Apple IIc and one really begins to wonder whether the SX-64 has a business future at all. Commodore themselves must be worried, they are currently looking at producing the Hyperion machine under licence.

HARDWARE Although the SX-64 is 'based on' the original machine, there has been substantial re-design of the various internal circuitry. Using a 6510, an upgraded version of the 6502, and equipped with the now famous elephantine 64K of RAM, the SX-64 still uses most of the original Commodore standard chips such as the SID. On the interface side, there's a parallel user port that can be adapted to drive the IEEE 488 devices, two nine-pin joystick/serial interface connectors and two DIN-type sockets that support the serial interface for disks, printers and the full sized colour monitor. There is no way to connect either the original Commodore cassette unit or a standard television set which means that you've got to buy the Commodore monitor if you want a bigger display. Test display on the 5" colour monitor is the standard 25 lines of 40 characters and is quite legible, although a full-sized display is really needed for non-remote operation.

The keyboard is detached and acts as the lid to the case. A cable links it to the underside of the main unit. Neglecting to remove the cable before swinging the handle to the carrying position can neatly smash the keyboard plug. The handle itself definitely needs re-designing as soon as possible — it seems to be intended to make the SX-64 uncarryable as it cuts into the hands.

SOFTWARE Bundled in with the machine are Easy Script, Easy File and Future Finance. The speed of the internal disk drive is barely better than a fast cassette interface, indeed there are now some turbo loading cassette systems which load faster than disc. Sadly the lack of a cassette interface means that you can't use this software with the SX-64. Commodore are now offering a fast 1 Mb disc but that requires extra hardware as it uses the IEEE standard



bus rather than the serial one provided.

MARKET SECTOR While Commodore would love to see the machine being used as a serious business portable, the speed of the disks and the vast amount of games software available will probably lower the market to the home/business level. It also looks very attractive to the serious home user looking for a disk-based system with a high entertainment content.

CONTENT As well as being able to add extra disk drives externally or adapt to use the faster IEEE drives, Commodore offer a range of printers, a pen plotter, the VIC modem and a choice of monitors.

COMMENT In pure technology terms, the SX-64 is now far too dated to achieve success in the business sector. As a top-end home machine, the substantial software support makes it attractive, just as the original PET survived well past its time. The recent announcement of the cut-down '16' to replace the even more aged VIC-20, and the Plus 4 with its bundled ROM software may make the potential buyer consider these instead. However, they are still fundamentally the same machines in a different wrapper and suffer the same agonising faults. In today's marketplace you may do better by taking the Apple IIc route or, if you're really serious about a portable powerhouse, the Apricot Portable. As a pure home computer though, it still takes a lot of beating.



Reviewers, you may well imagine, perch high in their ivory towers and have a lot of fun playing with the latest personal computers. Normally this vision is not too far from the truth. We do get early versions of machines to play with and get a feel for — then, generally later, we get the genuine article to review. Manufacturers are usually fairly flexible in their approach to us: allowing a reviewer a month with the product ensures that by the time the article gets into print it will, or should, accurately reflect the new system's strengths and weaknesses.

Some magazines with a penchant for sticking 'EXCLUSIVE' in pretty colours on their front covers seem to adopt the attitude that even a press briefing can provide sufficient information to actually write a 'review'. This practice is generally dangerous for, at the least, the 'reviewer' is misleading the readership and, possibly worse, these early articles can stimulate the market for what is essentially an unfinished product.

Writing a pre-release review certainly is not wrong. It's just something that needs to be handled very carefully indeed. Doyen of the computer magazine world, *Byte*, recently, and publicly, stated their revised reviewing policy because they felt that they hadn't been making the distinction between Preview and Review clear enough. Perhaps some UK magazines could learn a lesson or two here?

Of all the computer manufacturers around it's probably fair to say that Sinclair commands the most 'instant' press coverage. Ever since the launch of the original ZX80, each successive machine has attracted more and more attention than the last. Each launch has also been dogged by ever-longer production delays coupled with bigger demands. The original launch of the QL to the assembled multitudes of Press was on January 12th, and much was made of the fact that the machine would be delivered within 28 days if you ordered there and then.

To establish the veracity of this fact at least three journalists of my acquaintance parted with their personal, hard earned

cheques or credit card numbers while the launch was still in progress. I must confess to having been a little baffled by all the fuss at the launch; the machine may be interesting but there's nothing *that* outstanding about it; even bundled software has been done before!

THE DELAYS START NOW

It almost goes without saying these days that if someone launches today and promises tomorrow as a delivery date, you might get the goods in a month! In the computer field Sinclair has been as guilty as all the others of promising things that it patently couldn't deliver. Indeed, about the only computer company to meet its release date in recent months (or even years, come to that) has been the complete outsider,

Amstrad. Needless to say, the computer magazines immediately started tearing Sinclair to shreds and although the first units crept out at the beginning of May they were burdened by the presence of a 16K EPROM hanging out of the cartridge port. This Kludge contained the bits of SuperBASIC and QDOS that the programmers at Cambridge couldn't quite get to fit inside! With at least 20,000 QLs out and about as this review is written, Sinclair is now delivering the 'real' thing although several originally-promised features like concurrency seem to have been lost along the way.

To make things up to the buying packs of reviewers who couldn't get machines to play with, Sinclair also arranged trips to the factory to see the QL and talk with the Psion programmers. Stories about the chaos which resulted as Version X software failed to run on Version Y machines have now passed into legend and aren't worth repeating here. What I wanted was the real thing, in the peace and quiet of my home and not a trip to Cambridge!

The problem of the reviewer is now one of time. Having waited since the day of the launch to get a genuine, as-promised-to-the-public QL rather than a kludged-up prototype, he now discovers that Sinclair will only let him keep it for a week. A week to them means, at best, four evenings and half of a weekend in which to tackle the innermost secrets of the computer and its accompanying software. Just the briefest of looks at the documentation and a quick run through Quill and Easel revealed that to do a serious review of the software alone would need the Sinclair-allocated week with each! Ah, how those other superhuman re-

AT LAST THE QL

Henry Budgett

Seven months after the launch of the QL, we had just about given up on a review model. Suddenly Sinclair rang out of the blue and two hours later we had one, albeit for a week only. This is not as long a time in journalism as it is in politics, but here's what we managed to discover.

viewers must have worked to get all that information in just a day at Cambridge!

So, a decision had to be taken about the way in which this review would be tackled. Those expecting an in-depth review of the various Psion packages bundled in with the QL are, I'm afraid, going to have to wait. What you have here is a nutshell review of the machine as it came, the hardware environment that the software inhabits and a brief note or two on the packages themselves.

OPEN THE BOX

Packed into the substantial polystyrene box is, more or less, what you would expect if you'd ever opened a Sinclair Research parcel before. The QL is, like everything they've made since the ZX80, in a stylish black plastic case. No splotches of colour here — the case is black, the keys are black with white lettering... Hang on, something's wrong! Ah, he's abandoned that quirky single-key keyboard entry system that reduced competent typists to gibbering wrecks on the ZX Spectrum.

He's also done the decent thing and stuck a proper keyboard on it. Well, let's be fair, what's been fitted looks

like a decent keyboard (it's very similar to the NCR Decision Mate in styling) but the instant you touch it you realise that lurking under the hard keytops is that good old membrane system! The unrelieved monotony of the black is relieved (Uh, that's not right — Ed) by some rather snazzy ribbing and a chunky, heatsink-looking finned area at the rear. Shame that they didn't provide any holes for the hot air to get out through, though... The keyboard is as near 'standard' as any and features all the usual keys you would expect to find on an upmarket personal machine; it's even got a column of five function keys on the right which are heavily used by the four Psion packages.

The area to the right of the keyboard is slightly raised and the two QL Microdrives live underneath. Cartridges are fed to them (literally, one feels at times) through a couple of slots at the front. Two red LEDs indicate which of the drives is in operation — that's the one that you mustn't pull the cartridge out of! A third, yellow, LED is located at the bottom left of the keyboard and is supposed to indicate that the power is on; I say "supposed

to" because the thing glowed so dimly I didn't even realise what it was supposed to do at first — I suspect a fault here rather than a deliberate error. Oh, yes, I nearly forgot — there is no power switch.

The front and sides of the keyboard overhang the base plinth by about 10 mm (the whole case measures some 475 mm by 140 mm by 50 mm and weighs 1.2 kg) and conceal the various sockets from first glance. On the left of the keyboard is (or should be, but ours was missing) a plastic cap covering the hole for promised RAM and disc expansions to slot into. The connector inside is well recessed — the modules are going to be quite big by the looks of things — and is a 64-way Euroconnector. On the right of the keyboard is a familiar-looking edge connector that will allow you to expand your Microdrive capacity up to a total of eight. Just above and behind is... Great Scott, it's a Reset button! Press this and the machine will totally reset itself (shame about whatever you had in memory), and return you to the initial power-on state. It also makes remarkably pretty patterns on the screen as the

RAM clears!

The back panel contains a host of socketry. From left to right (looking at the back) we have; two Local Area Network sockets (3.5 mm jack as on the Interface 1), the three-pin power cable, and a monitor port (eight-pin DIN which doesn't work with Microvitec monitors, but does with Hitachi and Sanyo if you can afford the £14 that Sinclair Research will charge you for the lead). Next to this is a standard phono socket which is the modulated UHF output, and then comes a row of four of those lovely little sockets that British Telecom is now fitting all over the place. Nice, sturdy, well-designed things, but have you ever tried to buy cables for them? As a genuine reader service I'll let you know that Verospeed stock them but I'm sure that other places do as well.

The first pair are labelled SER 1 and SER 2 and provide the RS232 serial ports: the second pair are labelled CTL 1 and CTL 2 and are the joystick ports. Although there are two serial ports the signals appear as mirror images of each other, useful for certain common RS232 problems where you are never quite sure whether you're DCE or DTE. One of the more frustrating things about the two serial ports is that both input and output have to be set to the same baud rate, making them useless for operation with a system like Prestel.

Quite why Sinclair put joystick ports on a business machine is a little bit of a mystery. It could be that they want to add a mouse at a later date, but the system's software doesn't seem capable of handling it except through SuperBASIC.

Finally there is the edge connector socket for the ROM cartridge which, until recently, has been the home for the Kludge board. Although it is the same size and shape as the one found on the Spectrum's Interface 2, the cartridges from that machine will obviously not work with the QL (wrong processor!). Psion are promising to put later versions of their packages into ROM and, presumably, this is where they'll plug in, but more com-



ment on this later.

The underside of the box is held on by a number of screws and there are six rubber feet. The instant feel of the QL is that it is too flat to type on, and Sinclair have provided three extension feet to raise the back of the case to a better typing angle. The politest word I can find to describe them is useless! Packed into the box along with the QL is a chunky power supply brick in matching black plastic, the ring-bound manual, a handful of leads including the free RS232 lead and two packs of four Microdrive cartridges; one of blanks and the other with the four packages. The review machine came with a second copy of Abacus, a blank cartridge stuffed in the drives and only two blanks...

THE MACHINE INSIDE

Undoing the front and rear screws — *not* those under the Microdrives — releases the lid from the base. Two flat mylar-type ribbon cables connect the main PCB to the keyboard and there's also a bundle of separate wires to power the three LEDs. The keyboard assembly is shielded from the rest of the internal circuitry by a substantial aluminium sub-frame which also helps to keep the whole thing rigid.

The main PCB is well laid out and has remarkably few components. It's also smaller than you would expect, as the left-hand edge has been recessed to allow the plug-in modules plenty of room and the right-hand end is shaped to fit round the Microdrive mechanisms. All the main chips are socketed, a welcome improvement, and the biggest of these is the Motorola 68008 CPU located at the extreme left of the PCB. Next to this is a custom gate array which handles the memory management.

Then comes a block of 16 RAM chips, 4164s, which make up the 128K of supposedly user memory. If there is any fundamental flaw in the design of the QL this is where it is to be found. According to my rough calculations, by the time the screen has had its chunk of 32K and the operating system has nibbled around the edges, I don't think that there can be much over 90K left and even

this could be generous. The total memory addressing capacity of the 68008 is 1 Mb and Sinclair's promised 0.5 Mb RAM pack will certainly help in this area.

At the far right of the PCB is an Intel keyboard processor chip which also looks after the RS232 and sound, although on the review model the device was sourced from Philips. Behind the bank of RAM are two sockets for the QDOS and SuperBASIC ROMs. The review machine actually had three EPROMs, the left-hand socket holding the soldered one on top of the other. Labelled as being AH series, they have most of the early quirks ironed out but I'm sure that there's plenty of scope yet for bug-hunting hackers. The EPROM solution is neater than the Kludge in that only a single extra wire is needed, and this is carefully fitted, but it's certainly not an ideal solution. The loss of another 8K from the memory map to SuperBASIC and QDOS further reinforces the argument that the formers should never have been put in ROM at all.

The only other large IC is another custom chip for the Microdrive and network ports. The two Microdrives look exactly like the guts from the old Spectrum ones but the electronics have been tweaked to boost the data packing — the cartridges should now hold about 100K. The remaining circuitry is for the power supply and video drive; a standard Astec channel 36 modulator serves for the TV. A reasonable heatsink has been fitted to the primary power regulating chip, another long-awaited improvement, but the case still gets pretty hot as there are no air holes. The only holes deliberately drilled in the case are a set at the front underneath the Microdrives which let the piezo-electric loudspeaker BEEP quietly as you press the keys.

GOING ROUND AND ROUND...

The most obvious change to the Microdrives is that the data packing has been improved, but it's still worthwhile running FORMAT a few times to 'condition' the tapes. As storage media they are still as fundamentally unreliable as ever and even Sinclair are now acknowledging this by warning users to back up their Psion pac-

kages immediately. If you did this, you then wouldn't have any spare blank tapes, and as Quill demands a formatted blank in the second drive you can't use it without another shopping trip!

With a new operating system dedicated to the Microdrive one could reasonably have expected to be rid of the ludicrous syntax that Interface 1 users suffer; **LOAD *"m";l; "filename"** hardly rates as user friendly! QL users now have the almost equally stupid requirement that the device must be stated; **mdvl** even when they are the only I/O source you are using. There must be the capability for a default option somewhere in the ROM and the sooner it's found the better.

The manual does cover all the various system commands pretty well but a first-time user definitely has the advantage over a crusty old reviewer who has had to learn about 20 different operating systems and sometimes forgets which machine he's using today! What would be really nice, though, is to separate out the QDOS commands from SuperBASIC — ideally they should never have been mixed up in the first place — and provide the entry points. Software written by third party houses will need this information in order to do anything really useful and it would save the serious user a lot of trouble.

The fact that QDOS isn't any sort of standard is, considering Sinclair's previous track record, hardly surprising. I'd love to have been able to spend a little more time checking out the networking because this, in theory at least, should be the way to communicate between packages: export your data down the network to another user so they can take spreadsheet data and build it into a text report or get a graphical display.

SuperBASIC

An awful lot of nonsense has been talked about languages and most has been heaped, generally unfairly, on the head of BASIC. Sir Clive's right hand man, Nigel Searle, reckoned that SuperBASIC was so different to BASIC that it needed a new name. Well, they've certainly added some useful structures: procedures, defined functions and repeated loops, but there's nothing here that

hasn't been seen before. It's almost BBC BASIC in some ways, in others it looks a little like the C language but it has missed out completely on the provision of data structures.

There are certainly lots of little tricky bits; jumping out of FOR...NEXT loops is no longer bad programming with the EXIT command, and you can even have conditional ON...GOTO structures that look something like Pascal's CASE, but aren't quite so tricky to program. Although AUTO-numbering and block line deletion have now been added the RENUMBERING command is slightly less useful than expected, as it cannot handle RESTORE statements and often manages to mess up computed GOTO and GOSUB jumps.

The graphics commands included in SuperBASIC are pretty thorough and although the screen can have 256 by 256 or 512 by 256 resolution, the thing is actually pixel-mapped to make displays have the same proportions. With the much heralded windowing facility, different bits of the screen can be split to show different outputs, but this isn't a lot of use when you've only got a TV. PAPER and INK remain from the days of the Spectrum and line, circle and arc functions are all provided. New on the scene are a rectangle drawing function and a fill command: you can also re-define the screen colours.

Virtually all the rest of the commands and functions are pretty standard although it's nice to see a real-time clock-calendar and true bitwise logical comparisons. Multiple fonts can be synthesised by altering the x,y ratios of the characters to get up to four times normal size text but once again this looks best on a monitor.

Although the QL's SuperBASIC offers a lot of nice structures and many powerful features not often seen, it still suffers from being BASIC. Now, I've got nothing against BASIC — I use it all the time — but I fail to see why the language was built into the machine instead of coming on Microdrive or ROM cartridge. The space used up for system variables is wasted as far as the user of one of the Psion packages is concerned and we could have had an extra 32K of RAM fitted to allocate to the screen rather than having it

pinched from user memory. As for all this talk of offering C, I doubt if much will come of it until we have that extra 0.5 Mb RAM cartridge.

The most stunning thing about SuperBASIC, though, quite apart from the fact that it's really only as far removed from the original Dartmouth standard as BBC BASIC, is that it is slow. Benchmarks run well below expectations; it's about as fast as the Apricot which is a true 16-bit computer. This is the final nail in the coffin of those who keep on believing that the 32-bit processor will make things go four times as fast as an eight-bit. The 68008 is a 32-bit processor but only once you've got all the information into it... The eight-bit data bus would seem to mean that four bites were needed to get the four bytes into the processor, except for the rather clever Motorola system known as pipelining, where the processor can fetch information while simultaneously processing the last byte.

This system gives it an advantage over most eight-bit systems and puts it equal to many 16-bit ones, although the BBC Micro's BASIC is quicker, but also

shows up the fact that the Benchmark tests are long overdue for a radical overhaul! What we should be looking for these days is the power of the machine in terms of handling information; how fast is the screen, how quickly can you load programs and data from the mass storage unit and so on. On these tests the QL appears to have pretty quick graphics but the data transfer speed is way down on a disk-based system. Perhaps the readers could submit their ideas for a new set of standard tests?

THE PSION FOURSOME

Considering that Psion must have written the original versions of all four packages without any access to a real QL, their achievement is remarkable. Although the programs aren't integrated in the sense that they can cohabit the QL's memory (there isn't enough for that) they can Export and Import information from each other via the Microdrive. It isn't surprising to hear that new versions are being released all the time, just sad for those who aren't members of QLUB and won't get their upgrades for free.

No surprise, either, to hear that versions will be produced for other systems like the IBM PC and Apricot. They certainly should sell very well in that environment.

Although the packages are likely to be the main selling point of the QL they are in many ways restricted by it. There isn't enough memory for them and the slowness of the Microdrives compared with disks make them look far less powerful than they really are. Give this sort of software away with an IBM or Macintosh and you could well start a revolution! The latest indication is that the stuff will start to come in ROM cartridges rather than Microdrives. This will help the memory shortage somewhat as well as making them 'instant'.

QUILL

Out of the four packages that come with the QL this is almost certain to get the most use by the 'average' purchaser. It's pretty easy to get on with; at least it seemed that way during the short period that I actually managed to spend with it. Full on-screen help and the use of colour and brightness provide the much-vaunted WYSIWYG format. This wonderful acronym stands, in case you didn't know, for What You See Is What You Get. Personally I feel that all that colour contributes to the headaches I seem to be suffering these days!

It has most of the usual features that you would imagine a word processor ought to have; automatic formatting, adjustable tabs, block moves and copies and the ever-useful glossary. While all the previous are mundane, a glossary function is all that keeps most serious word processors from doing their computers to death and reverting to hunt and peck on a battered old manual typewriter (Heretic! Ed).

Compared to other word processing packages I have known, loved or hated (sorry, MicroPro but I still find Wordstar fundamentally annoying), the Quill is slower than it has any right to be. My typing certainly isn't fast but I found it relatively easy to out-type the look-ahead buffer. Mind you, the speed (or lack of it) of the keyboard probably works to Quill's favour in this respect. On the whole, though, Quill will be perfectly adequate for someone who's wordage output runs to a cou-

ple of letters a day. Journalists tempted by the unusual provision of a word counter (as opposed to the normal character count) or producers of large volumes of text probably need something a little bit better.

ABACUS

You either love your spreadsheet or covet someone else's. I have a particular fondness for Multiplan but given Abacus and a more powerful system than the QL I might, with some further trials, be persuaded that Psion really have got something rather good here. On small models, however, the package works rapidly and effectively and there's plenty of on-screen information and help available should you feel the need.

One of the troubles is that Psion, along with many other software houses producing spreadsheets, face a conceptual barrier. The general public seem to be convinced that a spreadsheet can only be used for handling information about money. Nothing could be further from the truth. A recent feature on Multiplan extolled the use of the machine in computing batting and bowling averages for a cricket club. I habitually use the product for generating comparison charts, although for this purpose a graphics option would be nice at times. Abacus can satisfy demands even as weird as these and does offer graphics through the Easel package.

ARCHIVE

This package is what you make of it, literally. At the most mundane of levels — and it must be admitted that the level at which I used it was pretty mundane — it offers a very easy-to-use data base system where you can set up card index type files. Searching, sorting and otherwise analysing the data is a snip, although it's a shame that Psion couldn't come up with a more entertaining demo than the old Vu-File Glossary. Mind you, it is the only one of the four to actually be provided with a demonstration file.

On the other hand Archive could become a remarkably powerful data base tool by making use of its built-in programming language. Although not by any means a serious challenge to the likes of dBase II and Friday! from Ashton Tate, it will cover the majority of needs.

FACTSHEET

| | |
|-------------------------|---|
| CPU | Sinclair QL |
| Clock | Price £399 including VAT, postage & packing £7.95 |
| RAM | 68008 |
| ROM | 7.5 MHz |
| Dimensions | 128K (expansion to 640K; not yet available) |
| Weight | 48K |
| Keyboard | 138 mm by 46 mm by 472 mm (5½" by 1¼" by 18¼") |
| Display | 1.4 kg (3 lbs) |
| I/N | Full-size QWERTY layout, 65 keys& including five function keys |
| OS | Up to 85 by 25 text display with various character sizes: TV format 40 to 60 columns |
| Language | High resolution graphics 512 by 256 four-colour or 256 by 256 eight-colour |
| Bundled Software | Twin built-in Microdrives for mass storage, capacity average 85K each. |
| Supplier | Two RS232 interfaces (baud rate selectable) |
| | Two local area network sockets |
| | ROM cartridge socket |
| | Two joystick ports |
| | Parallel expansion bus |
| | Sinclair QDOS |
| | Sinclair SuperBASIC |
| | Quill Word Processor |
| | Archive Database |
| | Abacus Spreadsheet |
| | Easel Business Graphics |
| | Sinclair Research. Mail order address is Freeport, Camberley, Surrey GU15 3BR, phone 0276 686100. QLs will be on retail sale from this month. |

It is here, more than with any other package, that the disastrous limitations of the Microdrive become apparent. I suspect that until the promised 0.5 Mb RAM pack and hard disk interface become available, most users will restrict themselves to small files. Losing a data base *really* hurts...

EASEL

If you want to paint pretty pictures on your TV or monitor then forget it. Easel is a remarkably serious business graphics tool and not another on-screen sketching program. Once the raw data is in the memory it can be displayed in any one of eight basic ways and, should these prove inadequate, you can make up your own as well.

Possibly the most annoying thing from the user's point of view is that because the higher resolution of screen has to be used there are only four colours available, which makes things a little difficult at times. From a personal point of view this is the package that I wanted more of and wasn't able to get because Sinclair took my QL away before I'd really got to grips with it!

SUPPORT

As far as the independent developers are concerned there is just one problem, the Microdrive. As an independently developed 'cheap' mass storage device for the ZX Spectrum it had appeal, but as the sole way (at the moment) of storing your precious data on a QL it simply isn't reliable enough.

For the software house there is another problem in the form of price. The cost of the basic cartridge to the end user is £4.95 with the bulk buyer getting something like 40% off. That still makes the cost of the media over twice that of an equivalent capacity disk and that's before any program has been duplicated onto it.

Here, again, the developer runs into trouble. There are a limited number of duplicators that are capable of handling the Microdrive cartridge and the mass buyers like Sinclair and Psion will, by virtue of the size of their orders, be almost certain to get priority. Even developing software for Sinclair Research carries this duplication problem although Sinclair will supply the cartridges themselves.

These difficulties were pre-



sent with the ZX Spectrum's Microdrive and, to the best of my knowledge at least, only one software house produced anything at medium — not counting the 'give-away' software that comes with the re-packaged Interface 1/Microdrive Expansion System. The major software effort at the moment seems to be centred on Joe the Lion's plan to get ZX Spectrum software, written in Z80 machine code, to run on the QL. Cross Assemblers are two a penny these days, the trick here is to get the Spectrum-format cassettes to load into a machine that doesn't have a cassette port!

On the hardware side we have already been offered standard disks and third-party parallel printer interfaces, not to mention colour-matched monitors and printers. Promises are one thing, seeing the goods appears to be another... Support has appeared, however, in the Read Only Floppy field (magazines, you fool). No less than two magazines have appeared (although the public could be forgiven for thinking that there's only one), along with an independent Users Group. The usual flood of books has also poured in; some good, some average and a lot that are downright awful. The interesting point about all this support is that it requires minimum commitment, like any service industry, and so it should prosper

regardless of how well the QL does!

CONCLUSION

So, just who is going to be parting with the short-earned £400 (although that assumes they've already got a TV or suitable monitor and printer) for the QL? Well, I doubt if it's going to be today's Spectrum owner. Even Sinclair must have been taken aback by the slow start that the Spectrum had with the ZX81 — owing fraternity and I'd lay odds that the same is going to happen here. For a start, the QL is just too different to the existing machine for the owner to want to throw out all his existing software and add-ons.

No, the ideal market for the QL doesn't really exist yet. It's partially going to be made up of those people who've been playing around with something like a ZX81 for the last couple of years and who know that they can use a computer for specific tasks but that their machine simply isn't big enough. Another group of potential users are those who use computers in their jobs and can see specific areas of use for a QL-like system in their home. It's going to sell on the strength of the bundled software, even if there are finite limits to the sort of use you can put the Microdrives to. As a 'hacker's' machine the QL is almost a total non-starter compared with systems like the

Amstrad or Einstein, which offer just as powerful facilities and the advantage of being a whole lot more 'standard'.

The BBC Micro, now looking rather long in the tooth, was generally bought against the ZX Spectrum because of its better graphics and (for its time) superb expandability. The QL misses out on both the potential areas. It's also worth considering that if SuperBASIC had been made available on Microdrive or cartridge rather than in ROM, the whole machine might, just might, have really been available on time! The potential users, and certainly those who are going to be buying the machine in volume, are unlikely to write programs in BASIC of any kind. They are going to be far too busy using the various packages for that.

Interesting rumours are currently circulating to the effect that Psion are going to be putting together a portable QL system to challenge the Apple IIc, but these are strenuously denied. What can't be denied is that Sinclair produced some speculative designs for an ICL personal computer quite some time before they actually released the QL. Plans seem to be well afoot to finish this off with a machine called OPD or One Per Desk. What price a QL with real disks and tele-com munications built in as an Apricot challenge?

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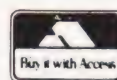
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Simon MacDismore

A long time ago in a galaxy far, far away. . . a group of researchers at Xerox's Palo Alto Research Centre sought to escape the evil clutches of conventional programming. Their work inspired the Smalltalk language, Xerox's Alto and Star workstations and Apple's Lisa. Now the Macintosh brings the revolution out into the streets. Will computing ever be the same again?



of the same information — and is understandably confused when a computer can only offer one at a time.

The Xerox researchers called this one-mode-at-a-time problem 'pre-emption', and they didn't like it. Being programmers, they wanted to be able to execute a piece of software, suspend it when they found a bug, and then edit their code without discarding the visual evidence of the error. Thus were 'windows' born — screen displays that behaved like sheets of paper which could be filed, placed on top of one another and folded to the smallest size necessary for the view required. Windows were still mode-oriented, but at least the user could work in several modes at the same time. The infamous 'mouse' followed

naturally as the most convenient way of moving around the screen.

The second worry was more fundamental. During the seventies, everyone wanted to design their own programming language. Literally thousands of new languages were conceived and implemented. Almost all of them behaved in the same way: you wrote a program, gave it some data, and got an answer. This distinction between data and what you could do with it didn't seem right to designers of office systems. It seemed quite obvious that, in most cases, how you could manipulate your data was more an attribute of the data itself than the program.

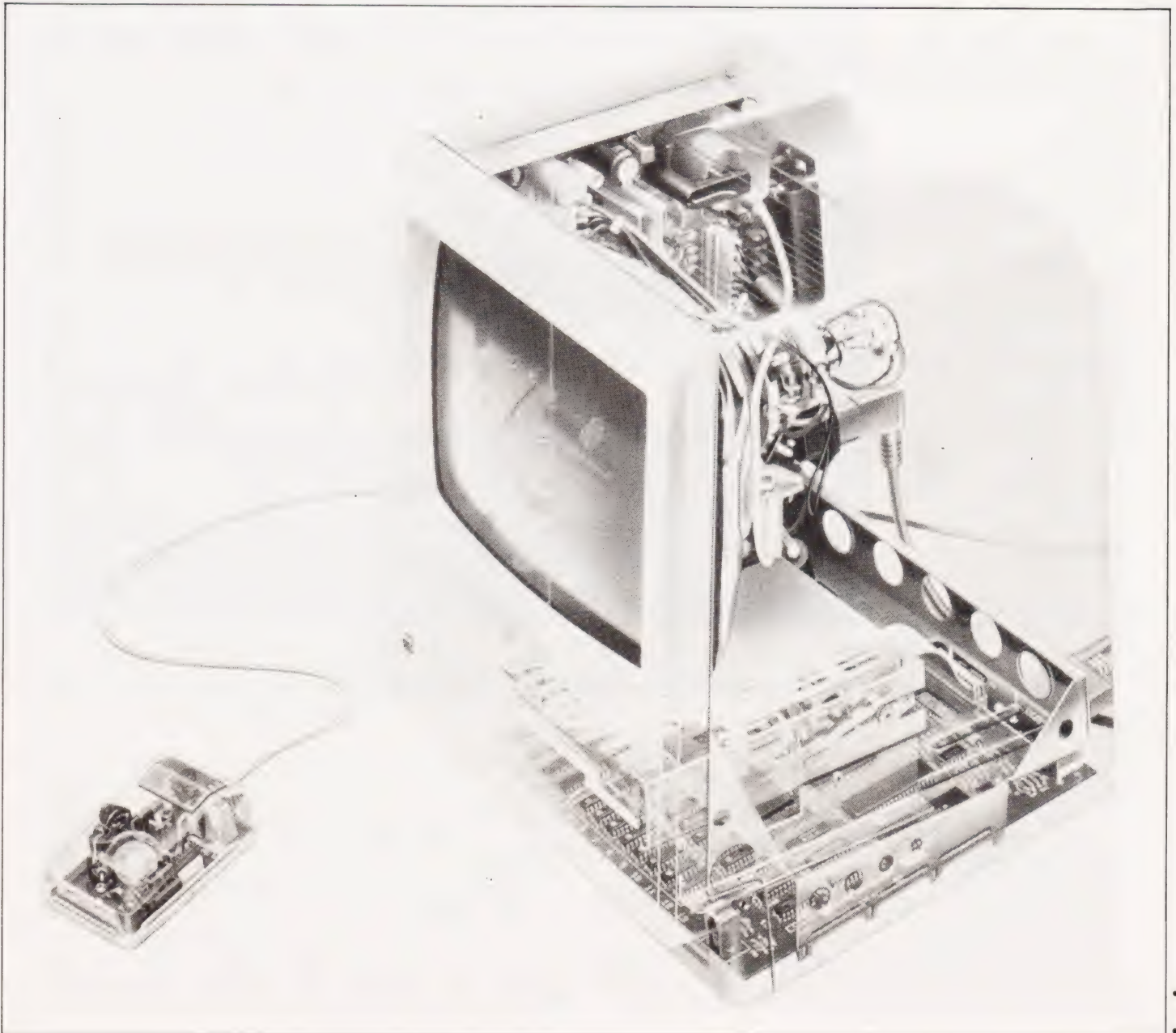
This led to a new idea about programming. Where existing languages were

"procedure-oriented" — working on dumb data in great detail — the new Xerox approach was to be "object-oriented" — manipulating data that knew about itself. An item of information which had the intelligence to know what could be done with it was called an object.

Xerox built a whole language and environment around these two concepts and called it 'Smalltalk'. The new environment was good at handling graphics, a task which involves particularly troublesome types of data. Xerox and graphic reproduction go hand in hand, and the lessons learned have been put to good use on their 8010 workstation (the 'Star') which sits on their local area network creating high-quality materials for laser printing.

Apple were smart enough to realise that this way of working with computers might catch on if the product was affordable. They spent a small fortune recruiting Xerox's researchers and designing their own product. According to some, the Lisa cost almost \$200 million to create, and when it hit the market everyone said it was wonderful. They also said that it was too expensive and too slow. Bigger companies might have considered hari-kiri at this point. Apple, however, is just a group of people doing what they feel like doing, so they tinkered with the design and started planning for the days of cheaper chips. They didn't have long to wait, and now the Macintosh, and a faster, cheaper Lisa 2, show the fruits of their patience.

The Mac, by the way,

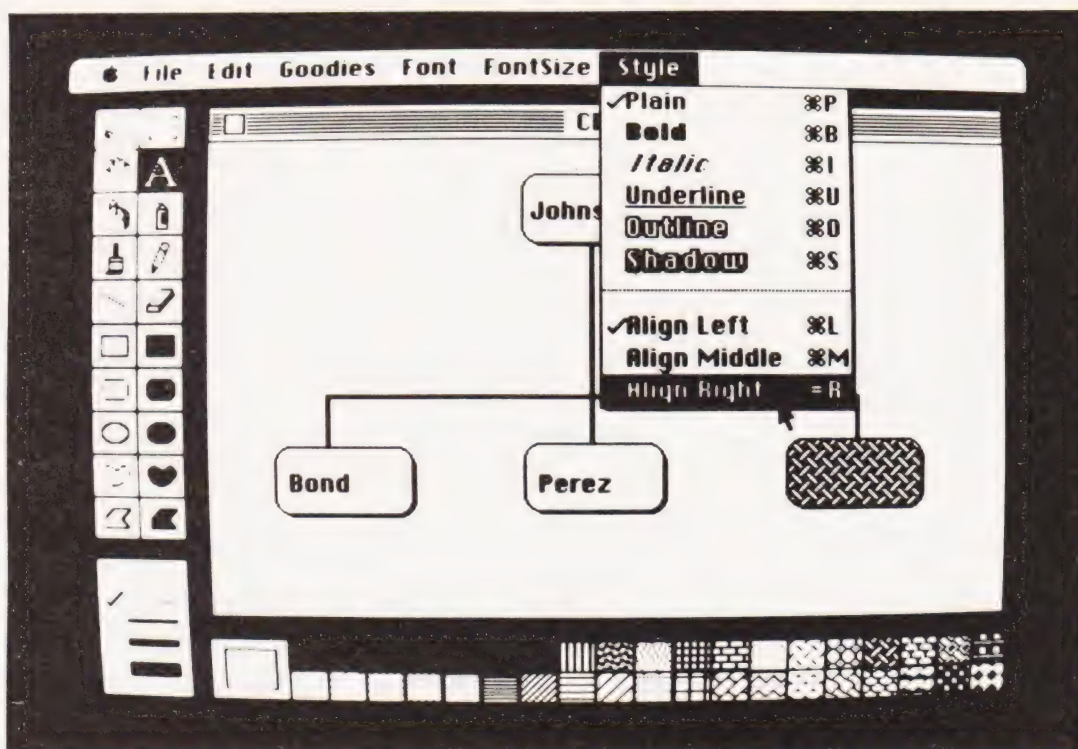


doesn't actually run Smalltalk — and indeed doesn't behave in quite the way that the Xerox group had intended (nor, for that matter, does the Xerox Star). To the user, though, it embodies most of the important features. Once you've grasped the concept of windows and objects (rather than dumb data) the behaviour of the Macintosh is disarmingly predictable.

FIRST, CATCH YOUR MOUSE

Find a clear area on your desk for the mouse — a little box with a rubber ball underneath it, which is connected to the system with a thin, very flexible cable. If your desk is dirty or very smooth, put a sheet of paper down for the mouse to travel on. To start with, you will probably want to use quite a large area (up to two square feet) for the mouse — much less once you get the hang of using it. Switch the power on and a quizzical picture of a floppy disk appears. Insert your disk (probably the MacWrite/MacPaint disk which comes bundled with the system) and the little picture grins at you while the system examines the disk. After a second or two (the delay is just below the threshold of irritation) the screen clears and your desktop appears. At the top, there is a menu bar (a list of instructions along a horizontal line). On the desk itself are illustrations of a disk (labelled MacWrite) and a Trash Can. These are "icons". For the time being, you can think of them as files or programs.

When you first sit at the desk, the disk and trash icons usually appear at the right hand side. Remember that this is only an assumption that the system makes — you can move them anywhere on the desktop by highlighting with the mouse and pulling them around. Why do this? When you have four or five windows (the most that are really useful at any one time) open on the same screen you may wish to override the Mac's assumptions about the most convenient way to arrange your paperwork. If everything gets unbearably messy the Mac will even provide an office cleaner to tidy the disk up again!



MacPaint offers a convincing demonstration of the Macintosh's strengths, equally at home with charts (top) and freehand drawings (bottom). These graphics can be integrated with the slightly less thrilling MacWrite to generate illustrated documents on the ImageWriter printer.

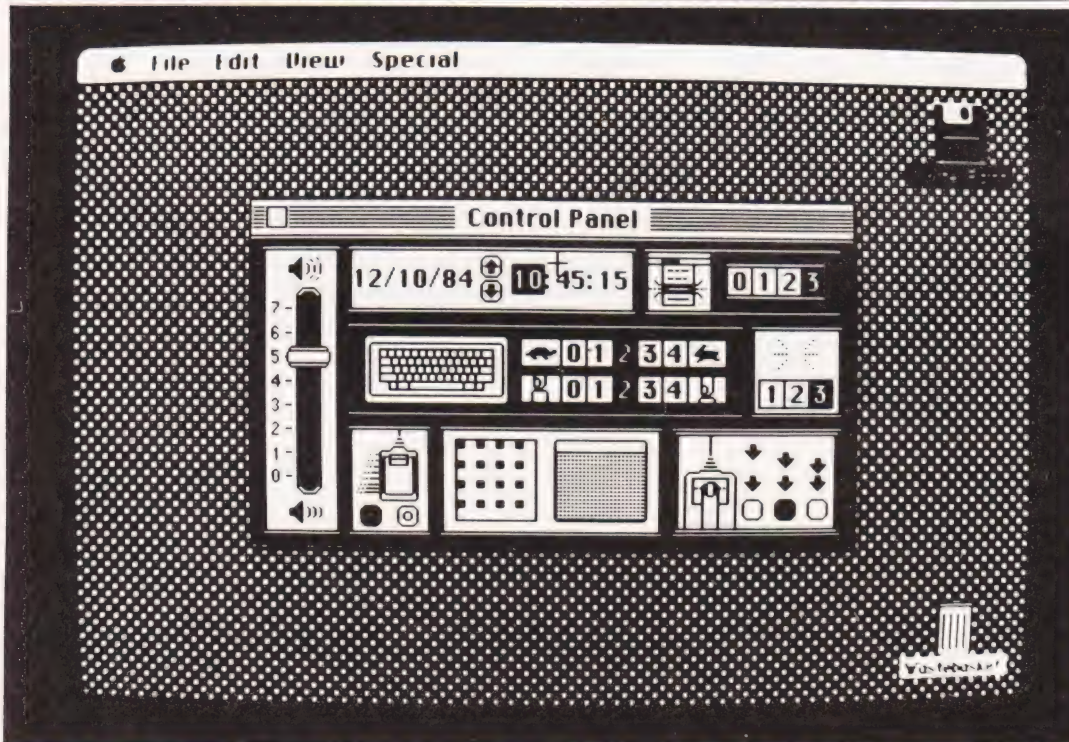
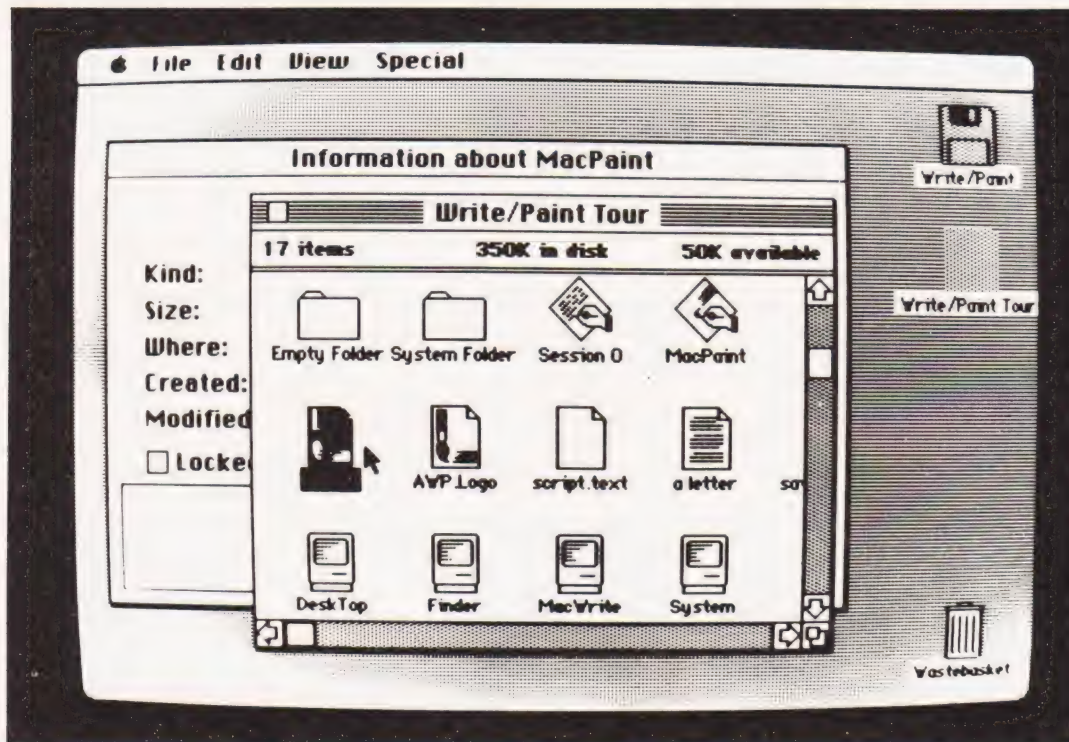
Once an icon is highlighted, you can "open" it. For each of the instructions (File, Edit, View, etc) on the menu bar there is a larger menu which you can pull down (like a window blind) using the mouse. In this case, the File menu shows "open" as a valid option (options that exist but aren't appropriate are displayed in a light tone instead of black). If you "open" your

disk, a new window appears on the desktop containing many different documents, programs, system routines and folders (which can hold many documents of different types). Information about each icon is available through the File menu, while icons can be copied using the edit Menu.

An intuitive understanding of the system begins to develop after a remarkably

short time, helped by the fact that it is very difficult to make an irrevocable error on the system. To discard an object, put it into the trash can. It can be retrieved at any time until the space it occupies on the disk is needed for more recent information. To rename an object, highlight the name with the mouse and type the new name at the keyboard.

This is where the strengths



The Macintosh protects users from the innards of the operating system. The various entities on the desk are identifiable by icon and name (top), while changes to the environment are made by adjusting the system's 'control panel' (bottom) — thus eliminating any confusion over operating system syntax or missing files.

of an object-oriented approach really make themselves felt. Because an object knows what can be done with it, the system logically cannot do anything foolish. If you highlight a document (perhaps prepared under the Macintosh multifont editor MacWrite) and open it, the MacWrite application is invoked immediately. By the same token, it is impossible to

open a (potentially dangerous) system routine unless an appropriate application exists.

The accompanying photographs show how the desktop is used, and illustrate some of the things that are possible using MacWrite and MacPaint. It's still too early to tell what software will be developed for the Mac — or how good it will be. Microsoft

have been working on MacVersions of their Multiplan Spreadsheet, BASIC language and 'The Word' editor, and we gather that some 100 other software houses are also committed to Macintosh support. The desktop metaphor is probably a good guarantee of usability, in that it forces authors to take a relatively consistent approach to user interaction.

Information is integrated using cut-and-paste via a special area called the 'clipboard'.

Becoming conversant with the Macintosh takes about twelve hours, including MacWrite and MacPaint. Apple supply training cassettes and disks which are synchronised with demonstrations on the screen. These were superbly produced, and took the listener through the system at quite high speed without being either superficial or patronising. It is definitely *not* safe to use the training disks for normal work — you risk serious problems (which are appropriately reported with an icon showing a fizzing bomb!).

To be cynical, the desktop is also Apple's best guaranteed of continuing income: any fool can design a mouse-based high resolution computer, but no other microcomputer operating system comes anywhere near the Mac/Lisa. After all, didn't two large manufacturers (no names, no pack drill) greet the first Lisa with promises of competing systems "within 12 months". Three years later, there is still no sign of these products (though very similar environments are appearing on larger Unix-type systems).

THE HARDWARE

The Macintosh hardware is simple — the key to reliable mass production. The system unit encloses a built-in 400K drive using a special version of the Sony 3½" microfloppy with a variable speed controller, and an interface for an optional second drive unit (about which more later). All the logic circuitry is contained on a single board which limits the potential for expansion. 128K RAM already seems too little for the system, and we were worried that there was no scope for increasing memory without fitting a new processor board. A second board drives the black on white high resolution screen, and there is no facility for driving external monitors.

Peripherals attach to the rear of the machine, which is clearly labelled with international symbols. There are interfaces for the mouse, a printer, serial communications and an external amplifier/loudspeaker. The only printer which will reproduce Macin-

Our thanks to First Computer Ltd, who kindly lent us a Macintosh for review.

tosh graphics is the Apple Imagewriter (available in 10" and 15" carriage widths) which therefore increases the price of the system by £400 to £600.

The keyboard is linked to the front of the system using a US telephone jack (though users are cautioned against testing the keyboard on their phone socket). Various shifts are available to select a range of non-standard characters, and an optional numeric pad can be daisy-chained to the keyboard if required. The balance between the keyboard and the mouse takes some getting used to — particularly under MacPaint, where the Shift key on the main keyboard conditions the software to draw only at 45 and 90 degree angles. Perhaps Xerox were right to put several buttons on the mouse: Apple only use one button, which is more elegant but not necessarily the most practical solution.

The system unit comes with a plastic push switch which when fitted on the side of the cabinet can be used to force a reset or interrupt: programmers can therefore experiment to their hearts' content without worrying about untrained users doing the same thing.

THE USER VIEW

This is a machine for the first-time user. More experienced (and perhaps cynical) hackers have to unlearn their prejudices. That takes a little time. The most controversial issue is the transition between the mouse and the keyboard — perhaps Apple would have been better off with a 'trackball' mounted on the keyboard unit. But trackballs are harder to use than mice, and it could be difficult to incorporate a selection button. Still, a hardware add-on of this sort might make sense for frequent users.

More seriously, there have been some significant compromises in order to keep the price down. The single disk drive is fine while you work through the Mac's tutorial disks, but in the real world people need to maintain separate disks for programs

and data. Some people even make backup copies of their data disks! The Macintosh falls down very hard at this point. One would have thought that the effort of swapping disks in and out is just what Apple would have tried to avoid in a user-acceptable system.

In our tests, we soon got to the point where data and programs could not co-exist on the same disk. Unfortunately, there is simply not enough room in 128K RAM to fit an application and the various system routines that it needs. Under MacWrite and MacPaint, this means that considerable effort goes into swapping disks, over and over again. Copying a document takes forever, and we honestly did not have the energy to embark in any test of a full disk copy. Jerry Poumelle, in his influential column in BYTE magazine, is quite scathing on the subject.

COMING SOON...

Our understanding is that a 512K RAM version of the Mac will be available once Apple have decided on a source for 256K bit chips. This would mean that an entire diskfull of applications could be held in memory, and still leave 112K for data. Until that day arrives, an additional drive would be essential for any serious use. This brings the price of our recommended configuration up to £2716 plus VAT. Another alternative is to buy a minimal configuration of the Lisa 2, which comes with 512K and a MacCompatible operating system as standard (apologies for the MacAbre pun). At £3346, configured with printer, this is hardly a cheap way to avoid the problems of the Mac's single drive, though it does offer an attractive expansion path to a hard-disk system.

The Macintosh, like the Apple IIc, is essentially a non-expandable machine. There are no slots free for interesting goodies, whether from Apple or anyone else — so a field upgrade to 512K seems unlikely. Adding a second disk drive eliminates one of the best features of the Mac — the small space it occupies on a desk and the resulting 'transportability'.

On balance, we felt that the disk space problems were so significant that Apple would

| | |
|-----------------------------|--|
| FACTSHEET | Apple Macintosh System Unit — £1795 |
| CPU | Motorola 68000 at 7.83 MHz |
| RAM | 128K standard, not expandable |
| ROM | 64K, containing system routines |
| Standard Features | Macintosh Mouse 4 voice sound controller and speaker Finder desktop environment MacWrite multi-font text editor MacPaint graphics editor <i>Guided Tour of Macintosh</i> <i>Guided Tour of MacWrite and MacPaint</i> |
| Training Tapes/Disks | System — 7.5Kg (344mm x 246mm x 276mm) |
| Dimensions | Keyboard — 1.2kg (65mm x 336mm x 146mm) Mouse — 0.2kg (37mm x 60mm x 109mm) |
| Display I/O | Hi-res 560 x 342 bit-mapped monochrome Macintosh Keyboard (with optional numeric keypad) Serial printer interface (9 pin D connector) Serial communications interface (9 pin D connector) Apple Mouse interface (9 pin D connector) Integral 400K 3½" floppy drive Controller and interface for second drive No external video output |
| OS | Macintosh custom DOS supplied with system |
| Options | Carrying case — £39 (standard), £69 (deluxe) Expansion 3½" Floppy Disk — £349 Imagewriter Printer — £423 (10"), £563 (15") Security fixing kit — £34 Numeric keypad — £69 |
| Current Software | MacWrite/MacPaint — £149 (bundled with Macintosh) MacTerminal — £69 Microsoft Multiplan — £149 Microsoft BASIC — £99 Macintosh Multichart — £99 |
| Planned Software | MacBasic, MacPascal, Assembler, Logo, MacProject, MacDraw, Multifile, Multiword |
| | We estimate that a Macintosh configuration with external drive, bundled MacWrite/MacPaint, the Imagewriter printer and one language or additional application would cost £2716. |

A Lisa 2 with one drive, 512K RAM, the Macintosh operating system, MacPaint/MacWrite at list price, Imagewriter and one additional application would cost about £3346.

probably put effort into a better configuration as a matter of urgency. If they don't, the BYTE verdict that the Macintosh is a wonderful toy may come home to roost. The small amount of memory means that many useful programs cannot be transferred to the machine. We could be wrong — if the market is big enough someone will find a way to cram a quart of software into the Mac's pint pot. Indeed, Peachtree are already selling Cash Book and Ledger Card products for the machine — and MacCoutancy (sorry . . .) is normally regarded as a particularly greedy user of space.

The Macintosh will be a great machine, but at the moment is held back by a lack of appropriate software and potential problems with disk and memory space. As an office system, it would also benefit from some sort of local area network or shared disk facility. Another year should see a much more mature product. If you have an immediate requirement for multifont, multilingual word processing with graphics, buy a Mac before the pound sinks any further against the dollar. If your needs are not yet served by the machine you should either wait or think again.

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| ADA A Programmer's Conversion Course S04 £16.50 | F. G. DAVENPORT Microprocessor Programming & Software Development D50 £27.95 | PROGRAMMER PRODUCTIVITY Myers, Methods and Workshop A65 £20.50 | Cliff B. Jones Software Development A Rigorous Approach J01 £18.95 | SPECIAL BONUS OFFER As a special bonus for joining now, all applicants whose membership forms are received by November 15 will receive at no extra charge: The Data Processing Manager's Survival Manual by Larry M. Singer Packed full of 'how to do it' guidance on the management of people and resources in the D P field, The Survival Manual is a hardcover volume of 226 pages, retailing at £23.70 | |

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Animation is movement, or implied movement, of objects around the screen. While most of this article is about animation on the 32K Atari 800, it can easily be converted, if necessary, for other machines. Animation on the Atari can be achieved, several different ways, before explaining these routines, I will introduce two ideas.

Colour registers The nine bytes in memory (704-712) where data is stored detailing the colours/luminances of the screen, characters, players and missiles. They can be set either by POKEs or use of the SETCOLOR command (bytes 708-712).

Display list This is the simple program ANTIC (the Atari graphics chip) uses for displaying to the screen. In its simplest form it consists of the address in memory where screen data is to be found, details of the mode types making up the screen display and the jump instruction to take ANTIC back to the start of the list again.

There can be more than one LMS (Load Memory Scan) address in the list—in fact, you can separately address every mode line if you need to.

CHARACTER MOVEMENT

The simplest form of animation is a movement of characters around the screen, as in Listing 1. This moves the letter 'A' rapidly across the screen and leaves it at position 37,0. Another method is to use strings, as in Listings 2,3 and 4.

On their own, these are of little use, but if we make use of the Atari's programmable character capability we can get some amusing action—see Listing 5. Fun isn't it! Now add the following lines:

```
65 POKE 755,4
```

and watch him run across the ceiling. Sadly, if we wish to put scenery behind our little character, life becomes very complicated. But, the Atari has an answer (more of which later).

SCROLLS

As mentioned earlier, ANTIC takes data for the screen from memory areas

pointed to by the LMS bytes in the display. If the values of the LMS address bytes are varied, the data displayed is altered. By repeatedly altering these by a set amount, a scrolling effect can be achieved.

Vertical scrolls Usually, a computer scrolls data by shifting the whole screenful up or down through the screen memory. It's not so on the Atari. In the normal graphics modes, the whole screenful of data can be taken from memory pointed to by a single LMS byte and its two address bytes. To simulate a shift up or down merely requires that we increment or decrement these two address bytes by the number of bytes taking up a screen line, eg 20 in BASIC Mode 1 (see Listing 6).

Horizontal scrolls This is more complex in that each line to be scrolled must have its own LMS command and address bytes. This means that we have to rewrite the display list and use a short machine code routine in order to get a smooth scroll. To simplify matters, it is common practice to assign each line of the screen to a different 'page' in memory and to scroll within the confines of this page by simply altering the low byte. Left scrolling is achieved by subtracting one from the value—right scrolling by adding one. For example, see Listing 7.

In effect, this program is like looking through a window 20 characters wide, and scanning back and forth over a page 60 characters wide. With some thought, I'm sure you could arrange for each line to be part of, for instance, a word processor program. In the earlier examples, I have moved the whole screen, but by applying the LMS only to selected lines or areas, you can move just parts of the screen (see Listing 8). You can even arrange for alternate lines to move in opposite directions, or whole sections of text to be deleted from the display.

As a rule, never let the memory areas you use cross 4K boundaries as it will confuse ANTIC. And one last thought; I wonder what would happen if you varied the LMS bytes in accordance with a simple mathematical formula?

Fine scrolls The Atari allows true fine scrolling of data over a limited range (up to 16 scan lines vertically and 16 colour clocks horizontally). This does not limit you in any way,

```
10 GRAPHICS 0: POKE 752,1
20 POSITION 0,0
30 FOR W=0 TO 37
40 FOR T=0 TO 20: NEXT T: REM ** DELAY
50 PRINT "< A": REM ** "< " IS CURSOR LEFT
60 NEXT W
70 GOTO 20
```

Listing 1

```
10 GRAPHICS 0: POKE 752,1
20 DIM A$(40)
30 FOR W=1 TO 40: A$(W,W)=" ": NEXT W
40 A$(38,38)="A"
50 FOR W=1 TO 40
60 POSITION 0,0
70 PRINT A$(W)
80 NEXT W
90 GOTO 50
```

Listing 2

```
10 GRAPHICS 0: POKE 752,1
20 DIM A$(40),B$(2)
30 FOR W=1 TO 40: A$(W,W)=" ": NEXT W
40 B$="A "
50 FOR W=38 TO 1 STEP -1
60 FOR T=0 TO 20: NEXT T: REM ** DELAY
70 POSITION 0,0
80 A$(W,W+1)=B$
90 PRINT A$
100 NEXT W
110 GOTO 50
```

Listing 3

```
10 GRAPHICS 0: POKE 752,1
20 DIM A$(2)
30 A$="A"
40 FOR W=38 TO 1 STEP -1
50 POSITION W,0: PRINT A$
60 FOR T=0 TO 20: NEXT T
70 NEXT W
80 GOTO 40
```

Listing 4

though, for if you combine coarse and fine scrolling, you can scroll across the whole screen. The following two steps will implement fine scrolling.

- Set the fine scroll enable bits for the lines to be moved:

horizontal scroll, bit 4 of the Mode number in the display list. For example, to enable a BASIC 0 line, change to 16+2 (BASIC 0 = ANTIC 2) = 18. Vertical scroll, bit 5 of the Mode number. For the above exam-

ATARI ANTICS PART 2

G. Lawrence

Having discussed Player Missile Graphics in October's article, this month we look at animation with plenty of examples to put some life into your programs.


```

10 GRAPHICS 17
20 POKE 709,0: POKE 712,140
30 FOR W=1536 TO 1575: READ A: POKE W,A: NEXT W
40 DATA 0,0,0,0,0,0,0,0,0,0,0,3,23,45,71,130,0,
0,0,192,232,180,226,65
50 DATA 0,0,0,3,7,29,39,18,0,0,0,192,224,184,22
8,72
60 POKE 756,6
70 FOR W=18 TO 0 STEP -2
80 FOR T=0 TO 90: NEXT T
90 POSITION W,0
100 PRINT #6;CHR$(1);CHR$(2);CHR$(0);
110 FOR T=0 TO 90: NEXT T
120 POSITION W-1,0
130 PRINT #6;CHR$(3);CHR$(4);CHR$(0);
140 NEXT W
150 POSITION 1,0: PRINT #6;CHR$(0);CHR$(0);
160 GOTO 70

```

Listing 5

```

1 REM LISTING 6
10 GRAPHICS 17: DIM A$(1000),B$(50)
20 B$="@@this@is@a@page@of@text@that@will@be@e@
@scrolled@by@me@@@@": REM ** @ = CONTROL/ ,
30 A$(LEN(A$)+1)=B$
40 FOR W=1 TO 4
50 A$(LEN(A$)+1)=A$
60 NEXT W
70 HI=INT(ADR(A$)/256): LO=ADR(A$)-HI*256
80 DL=PEEK(560)+256*PEEK(561)+4: REM ** LOW BYT
E OF THE L.M.S.
90 POKE DL,LO: POKE DL+1,HI
100 REM ** NOW MOVE DOWN
110 FOR W=1 TO 9
120 FOR T=0 TO 75: NEXT T
130 P=PEEK(DL): Q=PEEK(DL+1)
140 P=P+20: IF P>255 THEN P=P-256: Q=Q+1
150 POKE DL,P: POKE DL+1,Q
160 NEXT W
170 POKE 764,255
180 IF PEEK(764)=255 THEN 180: REM ** PRESS KEY
TO CONTINUE
190 REM ** MOVE UP
200 FOR W=1 TO 9
210 FOR T=0 TO 75: NEXT T
220 P=PEEK(DL): Q=PEEK(DL+1)
230 P=P-20: IF P<0 THEN P=P+256: Q=Q-1
240 POKE DL,P: POKE DL+1,Q
250 NEXT W
260 REM ** LOOP BACK
270 POKE 764,255
280 IF PEEK(764)=255 THEN 270
290 GOTO 110

```

Listing 6

ple the number will be 34.

• Store, in the appropriate scroll register, the number of scan lines or colour clocks you wish to scroll by. Horizontal scroll = 54276, vertical scroll = 54277. This will be applied to every line enabled.

As for normal scrolling, there must be a reserve of data to be scrolled in, and to prevent the nasty jerking you get on the last line, it's best not to enable this line. Listing 9 is a simple example. If you change line 70 to POKE W,82...., delete line 100 and change line 140 to POKE 54276,W, you will now have horizontal scrolling.

PAGE FLIPPING

This uses the same principles as coarse scrolling, except that you alter the LMS byte at the top of the area sufficient to com-

pletely change the displayed data within that area. So that you can still print this new screen, you also have to amend bytes 88-89 to point to the same address (see Listing 10).

COLOUR CHANGE IMPLIED MOTION

Moving pictures on a television screen are composed of a series of still pictures shown in rapid succession. Thus, if you could show a series of computer pictures in rapid succession, you would simulate motion in the same way. You usually need to resort to machine code to achieve the necessary writing speeds, but there is another possibility. If you draw the images in 'invisible ink', you can make them visible one after the other by switching the colour register for that 'ink' to a

```

1 REM LISTING 7
10 REM ** COMPOSE GRAPHICS 2 SCREEN
20 GRAPHICS 18: REM ** SET UP EVERYTHING
30 POKE 1536,112: POKE 1537,112: POKE 1538,112
40 FOR W=0 TO 35 STEP 3
50 POKE W+1539,71: REM ** ANTIC MODE 7 (BASIC 2
) WITH L.M.S.
60 POKE W+1540,128: REM ** MIDDLE OF PAGE
70 POKE W+1541,W/3: REM ** SET UP PAGE
80 NEXT W
90 POKE 1575,65: POKE 1576,0: POKE 1577,6
100 POKE 559,0: POKE 560,0: POKE 561,6: POKE 559
,34: REM ** ENABLE NEW DL
110 REM ** YOU NOW SEE A JUMBLE OF LETTERS
115 REM ** BUT YOU COULD HAVE MADE IT TEXT
120 REM SET UP M/C PROGRAM
130 FOR W=1580 TO 1603: READ A: POKE W,A: NEXT W
140 DATA 72,138,72,162,36,254,1,6,202,202,202,20
8,248,104,170,134,141,43,6,104,173,43,6,96
150 REM ** SCROLL LEFT
160 POKE 1585,254
170 FOR W=1 TO 60: GOSUB 500: U=USR(1580): NEXT
W
180 REM ** SCROLL RIGHT
190 POKE 1585,222
200 FOR W=1 TO 60: GOSUB 500: U=USR(1580): NEXT
W
210 GOTO 160
499 REM ** DELAY LOOP
500 FOR T=0 TO 25: NEXT T: RETURN

```

Listing 7

```

1 REM LISTING 8
10 DIM A$(150),B$(90),C$(90),F$(40)
15 F$="@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
"
18 REM ** @ = CONTROL/ ,
20 A$(1)=F$
22 A$(41)="can@you@see@this@@@if@not@press@Q"
23 A$(74)=F$
24 REM ** Q=CONTROL/Q
30 B$="@@@@@@@@@@@@@@@@@@@@@@@@can@you@read@this@be
tter@"
35 B$(LEN(B$)+1)="if@not@press@R@@@@@@@@@@@@@@@@
@@@@@"
37 REM R = CONTROL/R
40 C$="@@@@@@@@@@@@@@@@@@@@@@@@@you@must@be@able@to@
"
45 C$(LEN(C$)+1)="read@this@now@@@@@@@@@@@@@@@@
@"
50 FOR W=1536 TO 1561: READ A: POKE W,A: NEXT W
60 DATA 112,112,112,66,0,0,65,0,6,112,112,112
62 DATA 70,0,0,65,9,6,112,112,112,71,0,0,65,18,
6
70 A=INT(ADR(A$)/256): B=ADR(A$)-A*256
80 POKE 1540,B: POKE 1541,A
90 POKE 599,0: POKE 560,0: POKE 561,6: POKE 559
,34
100 FOR W=1 TO LEN(A$)-40
110 GOSUB 500
120 P=PEEK(1540): Q=PEEK(1541)
130 P=P+1: IF P>255 THEN P=P-256: Q=Q+1
140 POKE 1540,P: POKE 1541,Q
150 NEXT W
160 IF PEEK(764)=31 THEN 180
170 GOTO 70
180 POKE 560,9
190 A=INT(ADR(B$)/256): B=ADR(B$)-A*256
200 POKE 1549,B: POKE 1550,A
210 FOR W=1 TO LEN(B$)-20
220 GOSUB 500
230 P=PEEK(1549): Q=PEEK(1550)
240 P=P+1: IF P>255 THEN P=P-256: Q=Q+1
250 POKE 1549,P: POKE 1550,Q
260 NEXT W
270 IF PEEK(764)=30 THEN 290
280 GOTO 190
290 POKE 560,18
300 A=INT(ADR(C$)/256): B=ADR(C$)-A*256
310 POKE 1558,B: POKE 1559,A
320 FOR W=1 TO LEN(C$)-15
330 GOSUB 500
340 P=PEEK(1558): Q=PEEK(1559)
350 P=P+1: IF P>255 THEN P=P-256: Q=Q+1
360 POKE 1558,P: POKE 1559,Q
370 NEXT W
380 GOTO 300
499 REM ** DELAY
500 FOR DELAY=0 TO 50: NEXT DELAY: RETURN

```

Listing 8


```

1 REM LISTING 9
2 PRINT CHR$(125)
10 DIM A$(40)
15 A$ = @@@@@@@@@@@@@@Gnaw@yru@seedit@@@@@@@@@@@@@
20
30 POKE 710,14: POKE 712,14
40 B=INT(ADR(A$)/256): A=ADR(A$)-B*256
50 POKE 1536,112: POKE 1537,112: POKE 1538,112
60 FOR W=1509 TO 1610 STEP 3
70 POKE W,90: POKE W+1,A: POKE W+2,B
80 NEXT W
90 POKE 1611,65: POKE 1612,0: POKE 1613,6
100 POKE 1609,66: REM ** NO SCROLL LAST LINE
110 POKE 159,0: POKE 160,0: POKE 161,6: POKE 159
120 FOR W=1 TO 7
130 FOR T=0 TO 50: NEXT T: REM ** DELAY
140 POKE 54277,W: REM ** 'W' SCAN LINES
150 NEXT W
160 GOTO 120

```

Listing 9

contrasting colour. Listings 11, 12 and 13 show examples of such a technique.

PLAYER MISSILE GRAPHICS

As already mentioned, moving multibyte characters around the screen can involve very complex calculations. To simplify matters, Atari invented the idea of Player Missile

Graphics. In this system, each player missile is a sequential list of 256 eight-bit bytes which are very easily moved, as explained below. In addition, PMG allows the following:

- Four players, each in its own selectable colour.
- Four missiles, each in the same colour as its player.
- Three width settings for each player and missile.

- Two vertical resolutions.
- Overlapped areas in the third colour.
- Selectable priorities allowing 3D effects.
- Collision detection.

should be activated with:

POKE 53277,3

Widths The widths of the players are individually controllable by their width registers (53256 to 53259). The options are 0 = normal width, 1 = double width and 3 = quadruple width. Similarly, the widths of the missiles are controlled by their respective bit pairs in byte 53260.

Vertical resolution Players can be made up of either 256 or 128 bytes by POKEing 559 with either 62 for single resolution or 46 for double resolution. As mentioned above, the PM area must be set up differently for each player and missile.

Overlapping areas By setting bit five of the priority select register 623, you can choose to have the overlapping areas of colour in a third hue.

Priority selection Bits 0 to 3 of byte 623 are used to select the relative priorities of the players and the playfield: see Table 2.

Players Up to four players and four missiles are possible (more if you use special techniques): each has a colour determined by its own colour register (704-707). They consist of up to 256 bytes (128 in double line resolution mode) whose binary representation on screen forms the image. They may be placed anywhere in RAM provided that the PM base address is on a 2K (1K for double resolution) boundary. This PM address is set by POKEing its page number to memory address 54279. The actual data is POKEd into RAM starting 768 bytes (384 for double resolution) above this. The values in Table 1 are offset from the PM base address. Once filled with data (bytes that are not used should be emptied by POKEing with zeros) they

```

1 REM LISTING 10
10 GRAPHICS 18
15 DIM A$(1),B$(1),C$(1),D$(1),E$(1),F$(1),G$(1),H$(1)
18 REM ** SET UP NEW CHARACTERS
20 FOR W=1536 TO 1599: READ A
25 POKE W,A: NEXT W
30 DATA 0,0,0,0,0,0,0,0
32 DATA 255,255,255,255,255,255,255,255
34 DATA 1,2,4,8,16,32,64,128
36 DATA 128,64,32,16,8,4,2,1
40 DATA 1,1,1,1,1,1,1,1
42 DATA 255,0,0,0,0,0,0,0
44 DATA 128,128,128,128,128,128,128,128
46 DATA 126,255,219,255,239,255,195,126
49 REM ** SET UP COLOURS
50 FOR W=708 TO 712: READ A
55 POKE W,A: NEXT W
60 DATA 39,31,28,136,0
70 POKE 756,6: REM ** NEW CHAR SET
80 D=PEEK(560)+256*PEEK(561)+5
85 REM ** LOW BYTE OF L.M.S. ADDRESS
90 A$=CHR$(0): B$=CHR$(1): C$=CHR$(2)
92 D$=CHR$(3): E$=CHR$(4): F$=CHR$(5)
94 G$=CHR$(6): H$=CHR$(7)
95 POSITION 9,2: PRINT #6;H$:
100 POSITION 7,3: PRINT #6;C$:B$:B$:B$:D$
110 POSITION 7,4: PRINT #6;D$:B$:B$:B$:C$
120 POSITION 8,5: PRINT #6;B$:B$:B$:
130 POSITION 8,6: PRINT #6;E$:A$:G$
140 POSITION 8,7: PRINT #6;E$:A$:G$
150 POSITION 8,8: PRINT #6;F$:A$:F$
160 POKE D,PEEK(D)-8: POKE 89,PEEK(D)
165 REM ** FLIP PAGE
170 POSITION 9,2: PRINT #6;H$
180 POSITION 5,3: PRINT #6;F$:F$:F$:B$:B$:B$:F$:
F$:F$
190 POSITION 8,4: PRINT #6;B$:B$:B$
200 POSITION 8,5: PRINT #6;B$:B$:B$
210 POSITION 8,6: PRINT #6;C$:A$:D$
220 POSITION 7,7: PRINT #6;C$:A$:A$:A$:D$
230 POSITION 6,8: PRINT #6;F$:A$:A$:A$:A$:F$
240 POKE D,PEEK(D)+8
250 FOR G=0 TO 50: NEXT G
260 POKE D,PEEK(D)-8
270 FOR G=0 TO 50: NEXT G
280 GOTO 240

```

Listing 10

```

1 REM LISTING 11
10 GRAPHICS 10
20 FOR W=705 TO 712: READ A: POKE W,A: NEXT W
30 DATA 28,14,200,136,56,39,143,221
35 REM ** NORMALLY THESE WOULD BE IN THE BACKGR
OUND
36 REM ** COLOUR, SO THAT THEY ARE INVISIBLE
40 FOR W=1 TO 8
50 COLOR W
60 PLOT 10,W*3: DRAWTO 50,(W*3)+10
70 NEXT W
80 FOR W=705 TO 712: POKE W,0: NEXT W
85 REM ** NOW THEY ARE INVISIBLE
90 W=705
100 IF W=705 THEN POKE 712,0: POKE W,15: GOTO 12
0
110 POKE W-1,0: POKE W,15
120 W=W+1: IF W=713 THEN W=705
130 FOR T=0 TO 50: NEXT T: REM ** DELAY
140 GOTO 100

```

Listing 11

```

1 REM LISTING 12
10 GRAPHICS 1: C=1: DEG
20 FOR W=705 TO 712: POKE W,255*RND(2): NEXT W
30 FOR W=0 TO 359 STEP 2
40 COLOR C: C=C+1: IF C=9 THEN C=1
50 PLOT 40+9*SIN(W),80+20*COS(W)
60 NEXT W
70 FOR W=0 TO 359 STEP 5
80 COLOR C: C=C+1: IF C=9 THEN C=1
90 PLOT 60+19*SIN(W),80+20*COS(W)
100 PLOT 20+19*SIN(W),80+20*COS(W)
110 NEXT W
120 FOR W=0 TO 359 STEP 5
130 COLOR C: C=C+1: IF C=9 THEN C=1
140 PLOT 40+9*SIN(W),40+39*COS(W)
150 PLOT 40+9*SIN(W),120+39*COS(W)
160 NEXT W
170 W=705
180 IF W=705 THEN POKE 712,0: POKE 705,15: GOTO
200
190 POKE W-1,0: POKE W,15
200 W=W+1: IF W=713 THEN W=705
210 FOR H=0 TO 8: NEXT H
220 GOTO 180

```

Listing 12


```

1 REM LISTING 13
10 GRAPHICS 10
20 FOR W=705 TO 712: READ A: POKE W,A: NEXT W
30 DATA 28,143,56,200,136,221,35,15
40 DEG
50 P=1
60 FOR W=90 TO 450 STEP 5
70 COLOR P: P=P+1: IF P=9 THEN P=1
80 PLOT 40+15*SIN(W),20+10*COS(W)
90 DRAWTO 40+15*SIN(W),120+10*COS(W)
100 NEXT W
110 P=PEEK(705)
120 FOR W=705 TO 711: POKE W,PEEK(W)+1: NEXT W
130 POKE 712,P
140 GOTO 110

```

Listing 13

```

1 REM LISTING 14
10 GRAPHICS 23
15 REM ** SET UP COLOURS
20 FOR W=704 TO 712: READ A: POKE W,A: NEXT W
30 DATA 56,200,56,200,15,28,0,19,19
40 REM ** PMG SET-UP
50 P=PEEK(106)-32: POKE 54279,P:A=P*256
60 POKE 599,62
70 FOR W=A+1024 TO A+2047: POKE W,0: NEXT W
80 H1=53248: H2=53249: H3=53250: H4=53251
90 FOR W=A+1098 TO A+1106: READ B: POKE W,B: NE
XT W
100 DATA 255,60,90,149,149,149,149,66,60
110 FOR W=A+1354 TO A+1362: READ B: POKE W,B: NE
XT W
120 DATA 255,0,36,106,106,106,106,60,0
130 FOR W=A+1602 TO A+1610: READ B: POKE W,B: NE
XT W
140 DATA 60,66,149,149,149,149,90,60,255
150 FOR W=A+1858 TO A+1866: READ B: POKE W,B: NE
XT W
160 DATA 0,60,106,106,106,106,36,0,255
170 POKE 53277,3
180 REM ** DRAW SCENE
190 COLOR 3
200 FOR W=1 TO 7: READ J,K,L,M: PLOT J,K: DRAWTO
L,M: NEXT W
210 DATA 77,79,150,30,78,79,151,30,79,79,152
212 DATA 30,80,79,153,30,81,79,152,31,82,79
220 DATA 151,32,83,79,150,33
230 COLOR 1
240 FOR W=1 TO 7: READ J,K,L,M: PLOT J,K: DRAWTO
L,M: NEXT W
250 DATA 77,79,77,30,78,79,78,29,79,79,79,28,80
255 DATA 79,80,27,81,79,81,28,82,79,82,29
260 DATA 83,79,83,30
270 COLOR 2
280 FOR W=1 TO 7: READ J,K,L,M: PLOT J,K: DRAWTO
L,M: NEXT W
290 DATA 77,24,77,22,78,25,78,21,79,26,79,20,80
300 DATA 24,80,18,81,26,81,20,82,25,82,21,83,24,
83,22
310 REM ** NOW SET THINGS MOVING
320 FOR W=-30 TO 30 STEP 2
330 POKE 623,2
340 POKE H1,125+W: POKE H2,125+W: POKE H3,0: POK
E H4,0
350 FOR T=0 TO 10: NEXT T
360 POKE H3,125+W: POKE H4,125+W: POKE H1,0: POK
E H2,0
370 FOR T=0 TO 10: NEXT T
380 NEXT W
390 FOR W=-30 TO 30 STEP -2
400 POKE 623,0
410 POKE H1,125+W: POKE H2,125+W: POKE H3,0: POK
E H4,0
420 FOR T=0 TO 10: NEXT T
430 POKE H3,125+W: POKE H4,125+W: POKE H1,0: POK
E H2,0
440 FOR T=0 TO 10: NEXT T
450 NEXT W
460 GOTO 320

```

Listing 14

Collision detection. Each of the various collisions possible are logged in their own bytes: see Table 3. A POKE of any number to 53278 will clear these registers.

MOVING IN PMG

The two types of movements possible are achieved in two different ways.

Horizontal These require

```

1 REM LISTING 15
10 GRAPHICS 10
20 DEG: P=1
30 FOR W=705 TO 712: POKE W,255*RND(9): NEXT W
40 FOR W=0 TO 3600 STEP 10
50 COLOR P: P=P+1: IF P=9 THEN P=1
60 PLOT 40+(W/100)*SIN(W),80+(W/50)*COS(W)
70 NEXT W
80 W=705
90 IF W=705 THEN POKE 712,0: POKE W,15: GOTO 11
100 POKE W-1,0: POKE W,15
110 W=W+1: IF W=713 THEN W=705
120 FOR T=0 TO 25: NEXT T
130 GOTO 90

```

Listing 15

```

1 REM LISTING 16
10 GRAPHICS 10: P=1
20 FOR W=705 TO 712: READ A: POKE W,A: NEXT W
30 DATA 23,200,221,40,15,56,143,80
40 FOR W=39 TO 1 STEP -1
50 COLOR P: P=P+1: IF P=9 THEN P=1
60 PLOT 40+W,80-W: DRAWTO 40+W,80+W
70 DRAWTO 40-W,80+W: DRAWTO 40-W,80-W
80 DRAWTO 40+W,80-W
90 NEXT W
100 P=PEEK(705)
110 FOR W=705 TO 711: POKE W,PEEK(W+1):NEXT W
120 POKE 712,P
130 GOTO 100

```

Listing 16

TABLE 1

| Object | Single Resolution | Double Resolution |
|----------|-------------------|-------------------|
| Missiles | +768 to +1023 | +384 to +511 |
| Player 0 | +1024 to +1279 | +512 to +639 |
| Player 1 | +1280 to +1535 | +640 to +767 |
| Player 2 | +1536 to +1791 | +768 to +895 |
| Player 3 | +1792 to +2047 | +896 to +1023 |

TABLE 2

| Bit | Priority |
|-----|--|
| 0 | p0,p1,p2,p3,pf0,pf1,pf2,pf3,background |
| 1 | p0,p1,pf0,pf1,pf2,pf3,p2,p3,background |
| 2 | pf0,pf1,pf2,pf3,p0,p1,p2,p3,background |
| 3 | pf0,pf1,p0,p1,p2,p3,pf2,pf3,background |
| 4 | use all missiles as fifth player colour as pf3 |

Note: p = player, pf = playfield.

TABLE 3

| | |
|-------------------|---------------|
| Missile/playfield | 53248 — 53251 |
| Player/playfield | 53252 — 53255 |
| Missile/player | 53256 — 53259 |
| Player/player | 53260 — 53264 |

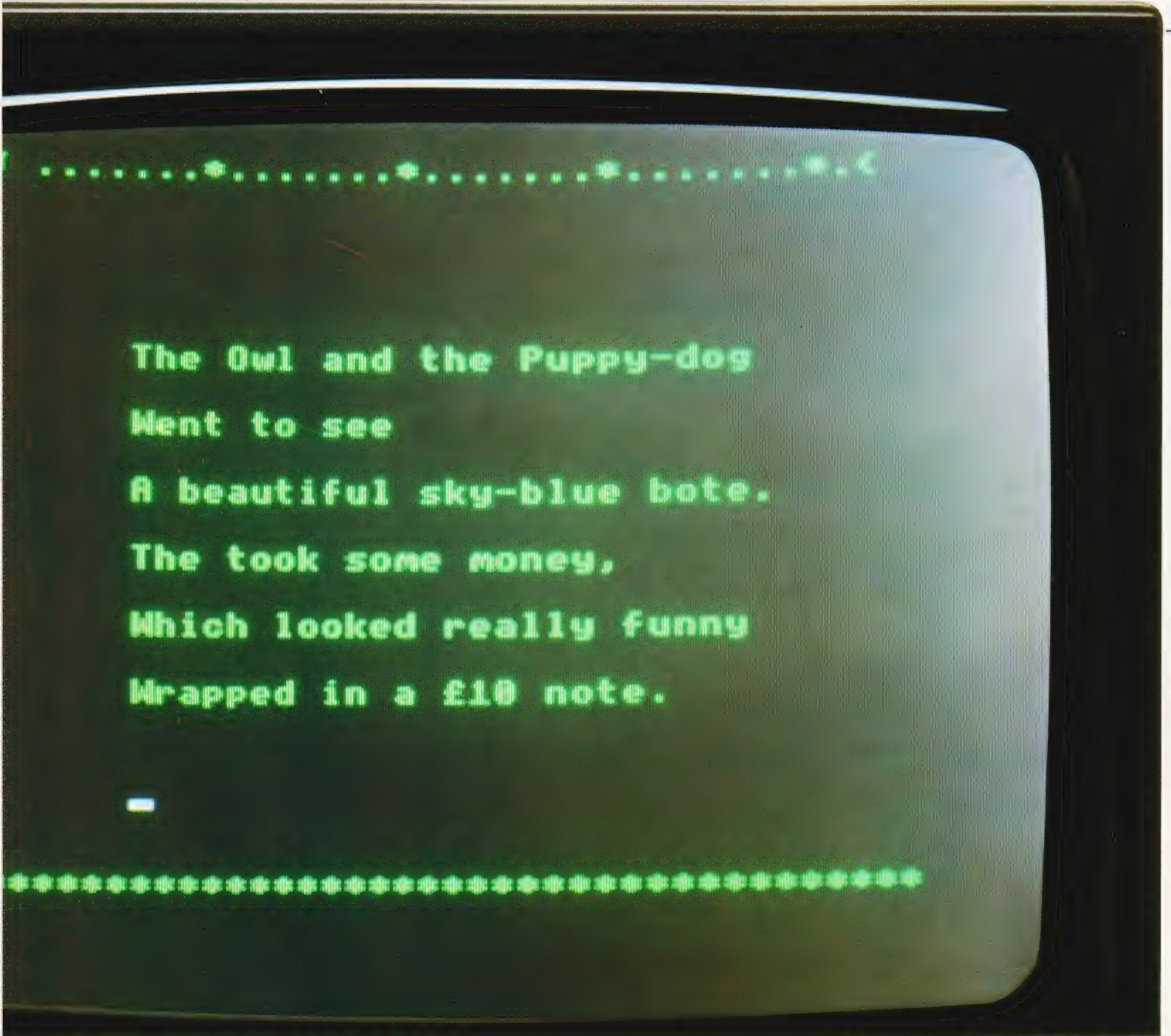
one simple POKE to the position registers 53248-53251 for players, and 53252-53255 for missiles. Although a range of 0 to 255 might seem possible, usually only 50 to 210 approximately are visible. Outside this range may be used for resting players when not in use. Note that these bytes may only be written to, reading them reveals the collision status.

Vertical This is more complicated, although much

easier than without PMG. It is best achieved by a short machine code routine that moves all zero bytes up or down one. See Listing 14 for an example: Listings 15 and 16 are assorted programs. Apparently, the author of 'De Re Atari' has a method of moving horizontally in PMG that uses strings and is rapid but does not use machine code, but I will leave that for you and your £16.95 to find out.



How to become before committing



The Owl and the Puppy-dog
Went to see
A beautiful sky-blue bote.
The took some money,
Which looked really funny
Wrapped in a £10 note.

—



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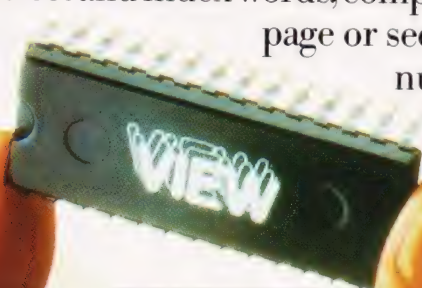
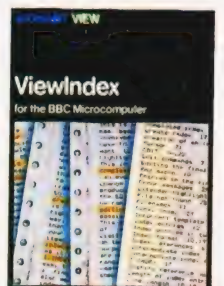
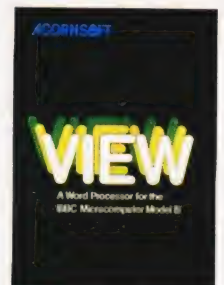
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ACORNSOFT

The text on the screen is in Mode 6.

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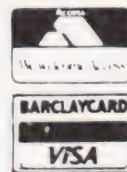
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MTX TOOLBOX

Richard Sargent

Routines to produce hi-res screen dumps and recover copy from a possible crash: essential reading for all MTX owners.



Avid readers of computer journals will probably realise that there are two ways of obtaining "hard copy" from the individual pixels of a high-resolution screen. The first method uses BASIC's "POINT" (or similarly named function) to decide whether a

pixel is INKed or not, and to send the result to a dot-matrix printer capable of producing high-resolution graphics. The problem with this approach is that there is a fair amount of maths involved in manipulating the way in which POINT scans the screen co-ordinates. The

code is not difficult to write, it's just that graphics screens have the bits in every byte laid horizontally in neat lines because that's the order in which the Cathode Ray Tube expects them; elements in one pixel-row. The dot matrix printer, on the other hand, needs to receive bytes in which the bits represent a single element in eight separate rows. All this adds up to the fact that the 10 lines or so of screen-dumping BASIC can take half an hour or so to do its work.

MACHINE CODE SOLUTION

If something is inefficient in BASIC, the usual course of action is to put the offending

routine into machine code. The user can now sit back and watch the screen print out in 60 seconds. Splendid? Well, splendid until you come to use a different type of printer and need to find the machine code routine (was it in high-memory or in the second-reserve cassette buffer ??) and then change the bytes (which ones?) to suit the new printer controls...

Why, then, are screen-dump routines not in the computer's own ROM? The answer is simple. Printer control-codes are not standardised and the computer manufacturer cannot possibly anticipate which model of printer you are going to use. (Sinclair is, of course, the exception which proves the rule.) However, Memotech have been rather more ingenious than the competition and have provided a routine in ROM which facilitates the writing of fast screen dump routines in BASIC:

GR\$ x,y,b

GR\$ is the name of the special MTX function. It looks at the pixel co-ordinates x,y and reads b number of bits from the

TABLE 1

| | | |
|-------|---|---------------------|
| Bit 7 | 1 | ink pixel at 0,191 |
| Bit 6 | 0 | paper only at 0,190 |
| Bit 5 | 1 | ink pixel at 0,189 |
| Bit 4 | 1 | ink pixel at 0,188 |
| Bit 3 | 1 | ink pixel at 0,187 |
| Bit 2 | 1 | ink pixel at 0,186 |
| Bit 1 | 1 | ink pixel at 0,185 |
| Bit 0 | 1 | ink pixel at 0,184 |

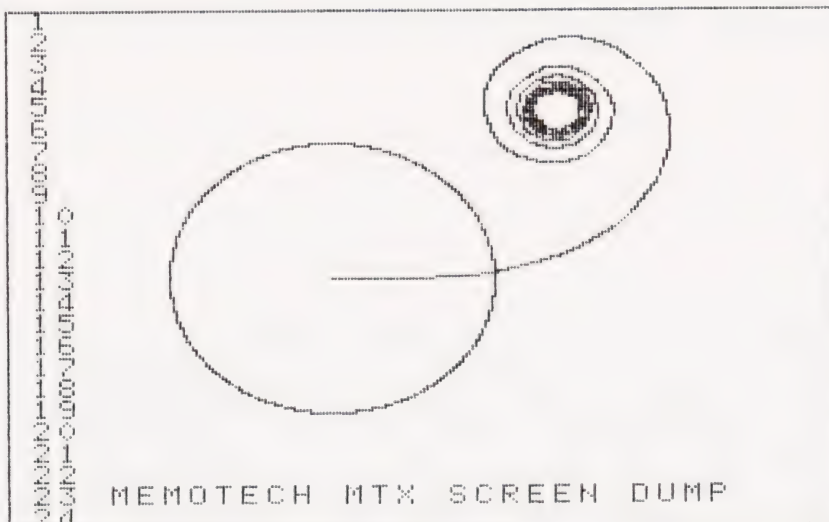
```

10 LPRINT CHR$(27); "A"; CHR$(8) :REM THE PRINTER IS SET TO AN 8-DOT LINE-FEED
15 FOR Y=191 TO 0 STEP -8 :REM STEP DOWN THE SCREEN IN 8-DOT LEAPS
20 LPRINT CHR$(27); "K"; :REM THE EPSON IS PUT INTO STANDARD HI-RES MODE
25 LPRINT CHR$(0); CHR$(1); :REM 00:01 IS REALLY 0100H OR 256 BYTES
30 REM NOW SEND 256 BYTES OF HI-RES INFORMATION
35 FOR X=0 TO 255
40 LET A=ASC(GR$(X,Y,8)):LPRINT CHR$(A);:NEXT X
45 LPRINT :REM THAT'S THE LINE FEED
50 NEXT Y :REM DO ALL THE Y COORDINATES
55 LPRINT :REM FINISHING LINEFEED
60 LPRINT CHR$(27); "@" :REM EPSON'S CODE TO RESET THE PRINTER
65 STOP :REM ** ALL DONE **

```

Listing 1. BASIC Screen dump.

Little and Large — the two sizes demonstrated at full size.

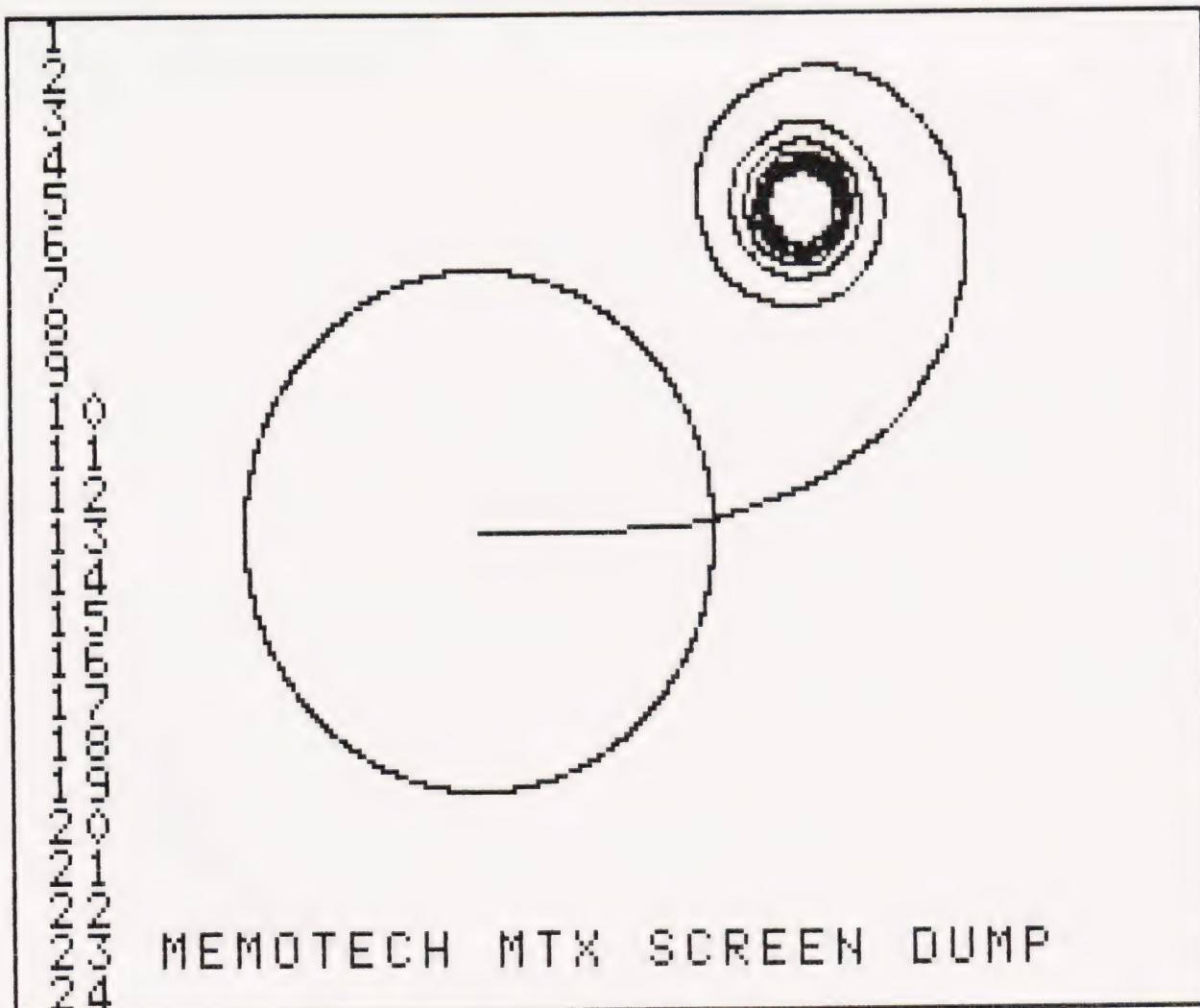


screen, returning bit=1 for every pixel which is set. The cleverness of GR\$ is that it looks at a vertical arrangement of pixels so that the value returned is in precisely the format required by the dot-matrix printer (see Table 1, which uses GR\$(0,191,8) as an example.

For some reason, GR\$ doesn't quite behave in the most logical of ways. LPRINT GR\$(x,y,8) doesn't work, which is a shame, and neither does LPRINT CHR\$(ASC(GR\$(x,y,8))), which perhaps isn't so surprising. However, LET A=ASC(GR\$(x,y,8)): LPRINT CHR\$(A) does work, so Memotech can breath a sigh of relief — they needn't start replacing their ROMs!

THE NEXT TIME

Two simple FOR-NEXT loops can now be set up to pass the




```

30 CLOCK "000000"
34 LPRINT CHR$(27); "A"; CHR$(B)
35 FOR Y=191 TO 0 STEP -8
40 LPRINT CHR$(27); "*" ; CHR$(4) ; CHR$(0) ; CHR$(2) ;
50 FOR X=0 TO 255
60 POKE 64161,ASC(CHR$(X,Y,8))
61 CODE

407C      LD A,(64161)
407F      LD D,0
4081      LD B,4
4083 L1:   RLA
4084      PUSH AF
4085      RL D
4087      POP AF
4088      RL D
408A      DJNZ L1
408C      LD A,D
408D      LD (64161),A
4090      RET

Symbols:
L1        4083

62 LET A=PEEK(64161): LPRINT CHR$(A);CHR$(A);: NEXT X
63 LPRINT : LPRINT CHR$(27); "*" ; CHR$(4) ; CHR$(0) ; CHR$(2) ;
64 FOR X=0 TO 255
65 POKE 64161,ASC(CHR$(X,Y,8))
66 CODE

4122      LD A,(64161)
4125      RLA
4126      RLA
4127      RLA
4128      RLA
4129      LD D,0
412B      LD B,4
412D L2:   RLA
412E      PUSH AF
412F      RL D
4131      POP AF
4132      RL D
4134      DJNZ L2
4136      LD A,D
4137      LD (64161),A
413A      RET

Symbols:
L2        412D

67 LET A=PEEK(64161): LPRINT CHR$(A);CHR$(A);: NEXT X
80 LPRINT : NEXT Y
83 LPRINT : LPRINT CHR$(27); "@" ; CHR$(13) ; CHR$(27); "F"
90 VS 5: PRINT TIME$: LPRINT TIME$: STOP
200 VS 4: CLS
201 FOR T=1 TO 22
202 PRINT T: NEXT T
203 PRINT " 23 MEMOTECH MTX SCREEN DUMP": PRINT " 24";
210 PLOT 100,92: ANGLE 0
240 FOR I=0 TO 1 STEP .01
250 DRAW 7: PHI I: NEXT I
280 CIRCLE 100,92,50
282 LINE 0,0,0,191: LINE 0,191,255,191
284 LINE 255,191,255,0: LINE 255,0,0,0
290 GOTO 30

```

Listing 2. Listing for the double-size dump.

screen information to the printer. Listing 1 shows the screen dump routine set for the Epson series printers, including the MT-80 if it has the high-res graphics ROMs fitted.

It should be possible to change the control codes to suit other printers. If you have the Seikosha uni-hammer printer, try changing all the 8s to 7s since this particular printer prints 7 pixel rows in hi-res graphics mode. The routine in Listing 1 prints a 108mm by 67mm screen dump in 102 seconds on an Epson RX-80.

The size of printout and the density of dots on the printout can both be altered by changing the hi-res graphics mode. For example, **CHR\$(27); "L";** will give you a distorted image

51 mm by 67mm. These screen-dumps are all rather small, so a special routine has been written to produce jumbo-sized printouts of 160mm by 135mm.

The new routine uses software to print a "four-pixel square" on the paper for every pixel on the screen, but the printer's hi-res graphics mode is also different and so the hardware is placing about 8 dots in the "four-pixel square" thus giving a dark, sharp image.

Listing 2 shows the full program, which has a demonstration routine at lines 200 onwards. The program should be started by a **GOTO 200**. The clue to whether or not your printer will accept the bytes given to it lies in line 40. Here the Epson

```

2 REM NEWWORD RECOVERY
4 LET R=0: LET A=35083: REM OR 38274
5 LPRINT : LET R=R+1: IF R=20 THEN GOTO 120
20 LET A=A+1: LET V=PEEK(A): IF V=0 THEN GOTO 140
50 IF V=141 OR V=253 OR V=13 THEN GOTO 5
80 IF V>127 THEN LET V=V-128
90 IF V<32 THEN GOTO 20
100 LPRINT CHR$(V);: GOTO 20
120 LPRINT : INPUT "Continue?"; I$: LET R=0: GOTO 5
140 LPRINT : PRINT "Text ended": STOP

```

Listing 3. For the recovery of Newword.

RX-80 (or FX-80) is told to accept a single line of 00;02 or 0200H (512) bytes. If other makes of printer can do that, the subsequent routines will work.

The large image is produced by expanding the bits (pixels) vertically, which is the task of the two embedded machine code routines, and expanding each byte horizontally, which is done by the **CHRS(A);CHRS(A)**, in lines 62 and 67. MTX owners will, I hope, remember to type "ASSEM61" and not "61 CODE" when they come to line 61 in the listing.

The jumbo print-out, although four times the size of the smaller version, prints faster and takes 303 seconds to complete. The mysterious location 64161 is a NODDY expansion vector which normally holds C9 or C3 hex. The contents of 64161 should really be saved prior to using the screen dump routine, and restored immediately afterwards, or else poor NODDY will crash...

NEWWORD RECOVERY

Our second routine concerns Memotech's wordprocessing software for the MTX, Newword, which like all wordprocessors, can sometimes crash due to either computer or human errors. But, unless you have suffered a power supply failure, your words of wisdom are probably still in the MTX dynamic memory: pity you can't get at them... Newword cannot warmstart.

The manner in which your words of wit and wisdom can be lost differs depending upon whether you have the disk or the ROM-based Newword. The trauma is the same in both cases, and can be triggered by one of three separate exercises:

- Accidentally pressing the MTX RESET keys.
- Locking up in BDOS ERROR:BAD SECTOR in disk-Newword.

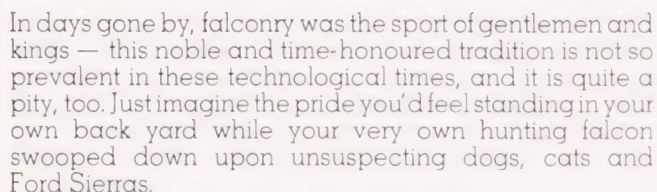
- Accidentally giving the "Quit without saving" command in ROM-Newword.

At worst, you could lose as much as 4000 characters in a disk-Newword crash and about twice as much in a ROM Newword crash. It really all depends on how conscientious you are about making your back-up copy every quarter of an hour. The short BASIC routine saves the day (more or less). It isn't perfect because it doesn't restore your text into Newword, it merely types out whatever is in RAM memory, but it's certainly better than nothing. However, should you be visited by the Muse in a big way and entirely neglect the SAVE routines, you will not find yourself lost for words if you have this stand-by program.

The recovery is simple. Reset the MTX and use ROM BASIC or disk BASIC to enter or LOAD the recovery routine. The recovery routine is so short that it will not overwrite the Newword document, which is in high memory. **LET A=38274** for the disk version and **LET A=35083** for the ROM-based package.

If you suspect that you have a very early version of MTX Newword, it is worth checking these addresses. This is but a small task, and involves typing "quick brown fox" into a fresh Newword document, then resetting the MTX and using the PANEL to locate "quick brown fox" in memory. The program screens and prints 20 lines of text at a time and will continue to do so until the null end-of-file marker is reached. All types of Newword carriage-return and linefeed codes are processed as simple ODs and OAs and all other control codes are ignored. The printed result may not look beautiful, but the words will be there and your innovative formula for a water-driven pollution-free electrically-heated rickshaw will be preserved for posterity.





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COMMODORE 715B

CPU 6509
MEMORY 56K RAM, 20K ROM
LANGUAGE Commodore BASIC
MASS STORAGE No cassette
Single or dual 5¼" floppy disk drives
Commodore's DOS
OS QWERTY, cursor, numeric pad,
function keys
KEYBOARD RS-232C, IEEE 488, memory bus, eight-
bit parallel, cassette port, second
processor bus
INTERFACES Monochrome monitor supplied
80 by 25 text, block graphics
DISPLAY Three channels
GRAPHICS
SOUND

Notes. The Commodore 715B is the top model in the 700 range of business machines. Although built round the 6509 processor, there is a second processor option (8088). The machine has been designed to meet IEC specifications. The black-and-white monitor screen is integral and features tilt and swivel. The keyboard may be detached.



COMMODORE 64

CPU 6510
MEMORY 64K RAM, 26K ROM
LANGUAGE Commodore BASIC
MASS STORAGE Cassette unit at 300 baud
5¼" floppy discs available
Commodore's own
OS QWERTY, cursor, function keys
KEYBOARD IEEE 488 bus, cartridge port, cassette
INTERFACES port, two joystick/light pen ports
TV output
DISPLAY 40 by 25 text, block graphics (user-
GRAPHICS definable)
320 by 200 high resolution graphics in
16 colours
SOUND Three channels

Notes. The Commodore 64 is a popular micro with a great deal of games software available. There is also some business software, such as spreadsheets and word processors, available but this suffers from the lack of an 80-column screen. Graphics and sound have extensive capabilities, for example eight multicolour sprites and three channels of sound covering nine octaves each.

xi APRICOT

| | |
|---------------------|--|
| CPU | 8086 |
| MEMORY | 256K RAM |
| LANGUAGES | Microsoft BASIC, Personal BASIC |
| MASS STORAGE | No cassette drive Integral Sony 3½" 315K microfloppy disk drive |
| OS | Integral 5 or 10 Mb hard disk MS-DOS 2.11 with GSX bundled CP/M-86 (not yet available) Concurrent CP/M-86 (not yet available) |
| KEYBOARD | QWERTY, cursor, numeric pad, function keys |
| INTERFACES | RS-232C, Centronics, Microsoft mouse |
| DISPLAY | Monitor (supplied) |
| GRAPHICS | 80 by 24 text with block graphics 800 by 400 high-res graphics under GSX |
| SOUND | No |

Notes. The Apricot xi is a development of the award-winning Apricot, and replaces one of the latter's disk drives with an integral hard disk, providing vastly increased storage with faster access. Memory may be expanded in 128K increments to a maximum of 768K. The languages and operating systems mentioned above come bundled (except for Concurrent CP/M) and four software tools are also bundled, including an asynchronous package for use with the optional modem card.

APRICOT F1

| | |
|---------------------|--|
| CPU | 8086 |
| MEMORY | 256K RAM |
| LANGUAGES | MS-DOS, Concurrent DOS (Optional) |
| MASS STORAGE | No cassette drive One integral 3½" 720K Sony microfloppy disk drive |
| OS | MS-DOS 2.11, Concurrent DOS (optional) |
| KEYBOARD | QWERTY, cursor, numeric pad |
| INTERFACES | Infra-red link for keyboard or mouse, expansion slot, RS-232C, Centronics |
| DISPLAY | TV or optional monitor |
| GRAPHICS | 80 by 24 text 640 by 256 four-colour, 320 by 256 16-colour maximum high resolution |
| SOUND | No |

Notes. The Apricot F1 is designed as a low-cost entry-level machine for small businesses (a cheaper cut-down version, the F1e, is for schools and colleges). It includes several bundled applications including SuperCalc, SuperWriter and SuperPlanner. An optional five-slot expansion bus may be added: also a 10 Mb Winchester unit. There is an optional infra-red mouse/trackball. RAM is expandable to 768K.



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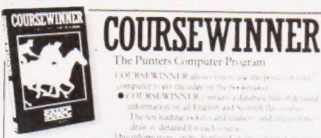
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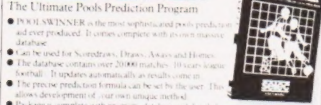
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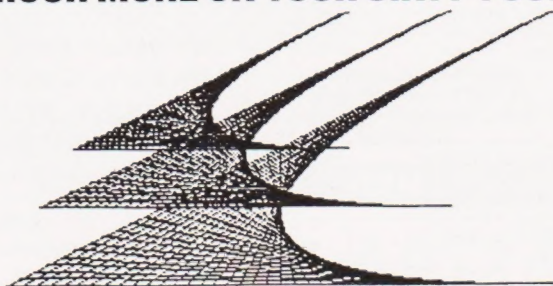
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